# SERIES 400

# PROFESSIONAL AUDIO RECORDER

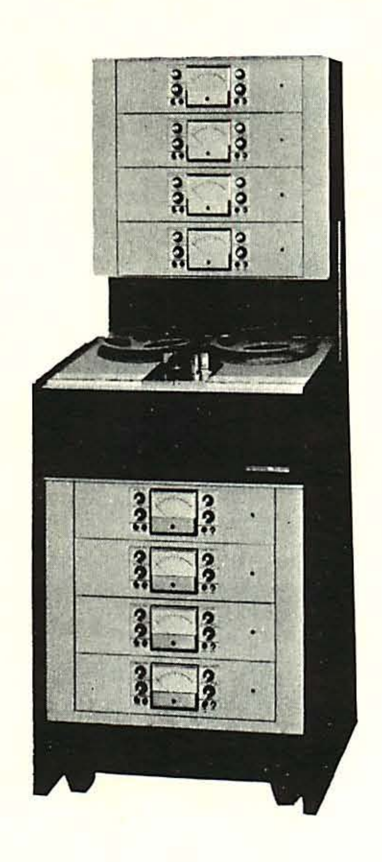
## INSTRUCTION MANUAL

MINNESOTA MINING AND MANUFACTURING COMPANY

300 SOUTH LEWIS ROAD, CAMARILLO, CALIFORNIA 93010



# 3M Brand
# Professional Audio Recorder
## Series 400



## INSTRUCTION MANUAL

MINNESOTA MINING AND MANUFACTURING COMPANY
300 SOUTH LEWIS ROAD • CAMARILLO, CALIFORNIA 93010

M23 RRM 2-69

This 3M M23 manual
was
"scanned by the klettster"
as a GIFT*

to those who have these machines
and want to keep them operational

The 3M M23 was the first 3M iso-loop
tape recorder for professional use

3M M23 machines were around 45 years
old at the time this scan was made

enjoy this...
keep the reels turning

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# INTRODUCTION

This Instruction Manual has been prepared for the convenience and use of owners of the 3M Brand Professional Audio Recorder. The manual is supplied with each recorder shipped from the factory, and should be consulted before installation and operation of the recorder is attempted.

This manual is a revised edition of the original Series 400 Professional Audio Recorder Instruction Manual. It contains information reflecting changes made in the recorders with serial number above 250. Much of the original information contained in the earlier manual has been retained or expanded in this manual and is applicable for all Series 400 Recorders. However, care should be taken in the event this manual is referenced when used with machines having serial numbers 250 or lower. Differences, although minor in most cases, could cause difficulty in troubleshooting and ordering replacement parts or assemblies.

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Figure 1. 3M Brand Professional Audio Recorder

# GENERAL DESCRIPTION

The 3M Brand Professional Audio Recorder is manufactured by the Mincom Division of the 3M Company in Camarillo, California. It fulfills a requirement in the professional recording industry for the ultimate quality in tape recording. The continued improvements in records, tapes, and playback equipment revealed deficiencies in original master recordings. The 3M Brand Professional Audio Recorder overcomes these problems and provides improved master music tapes -- improvement readily discernible by ear.

The 3M Brand Professional Audio Recorder provides significant improvements over present professional audio recorders in three basic areas. Probably the most import of these is the improved dynamic range, as much as 15 db. The second area of improvement is a new tape drive system that reduces flutter to half that present in other tape transports in the audio field. Third, the entire system affords an operating and editing ease unmatched by any other tape recorder. Other improvements, not readily apparent, are an increase in the long-term reliability due to the exclusive use of silicon transistors in the electronics assemblies plus the simplified tape-drive system.

The 3M Brand Professional Audio Recorder achieves its outstanding performance from such patented techniques as the 3M Dynatrack system of recording and playback, and the Isoloop tape drive system; plus experience gained from over a decade of design and manufacture of Mincom, state-of-the-art, aerospace tape recorder-reproducer systems.

## FUNCTIONAL DESCRIPTION

Functionally, the 3M Brand Professional Audio Recorder operates on the same basic principles as any other tape recorder. These principles are covered in many textbooks and will not be presented in this manual. As stated, the features that give this recorder its outstanding performance are the Dynatrack technique of recording and reproducing, and the Isoloop tape drive.

## DYNATRACK ELECTRONIC SYSTEM

The Dynatrack technique improves signal-to-noise ratio and expands the recorded dynamic range of tapes by as much as 15 db over other recorders. These improvements are the result of a revolutionary, yet relatively simple, diversity recording and reproducing system. The diversity system feeds the same signal through two recording heads, mounted parallel in the same head stack, and records two separate, full band information tracks simulatneously. Every channel in the Dynatrack recorder (one channel for mono, two for simple stereo, or three for

multi-channel stereo, or stereo and mono together), records two information tracks.

One track of a channel is recorded at a normal level, following NAB recording standards. The other track, recording the identical information records signals at a higher level (more recording amplifier gain), employs a preemphasis curve rising 15 db from 400 Hz to 15,000 Hz (figure 2A).

The track recorded at normal level can handle higher signal levels, so it is called the H track. It will reach distortion levels in accordance with standard VU meter practice and with NAB response and distortion specifications. The other track, with its preemphasized, higher-level signal, is better suited for recording signals of a much lower sound level, so it is called the L track. This L track will go into overload distortion at high-frequency signal levels considerably below 0 VU on the meter. But when reproducing very soft sounds, which are usually lost in tape noise when recorded at normal levels, the L track will put out a clean, undistorted signal at a level well above tape noise (figure 3).

Once these two tracks are recorded as described, the only remaining problem is to arrange for playing back the proper track -- that track with minimum noise or minimum distortion -- and at the proper signal level.

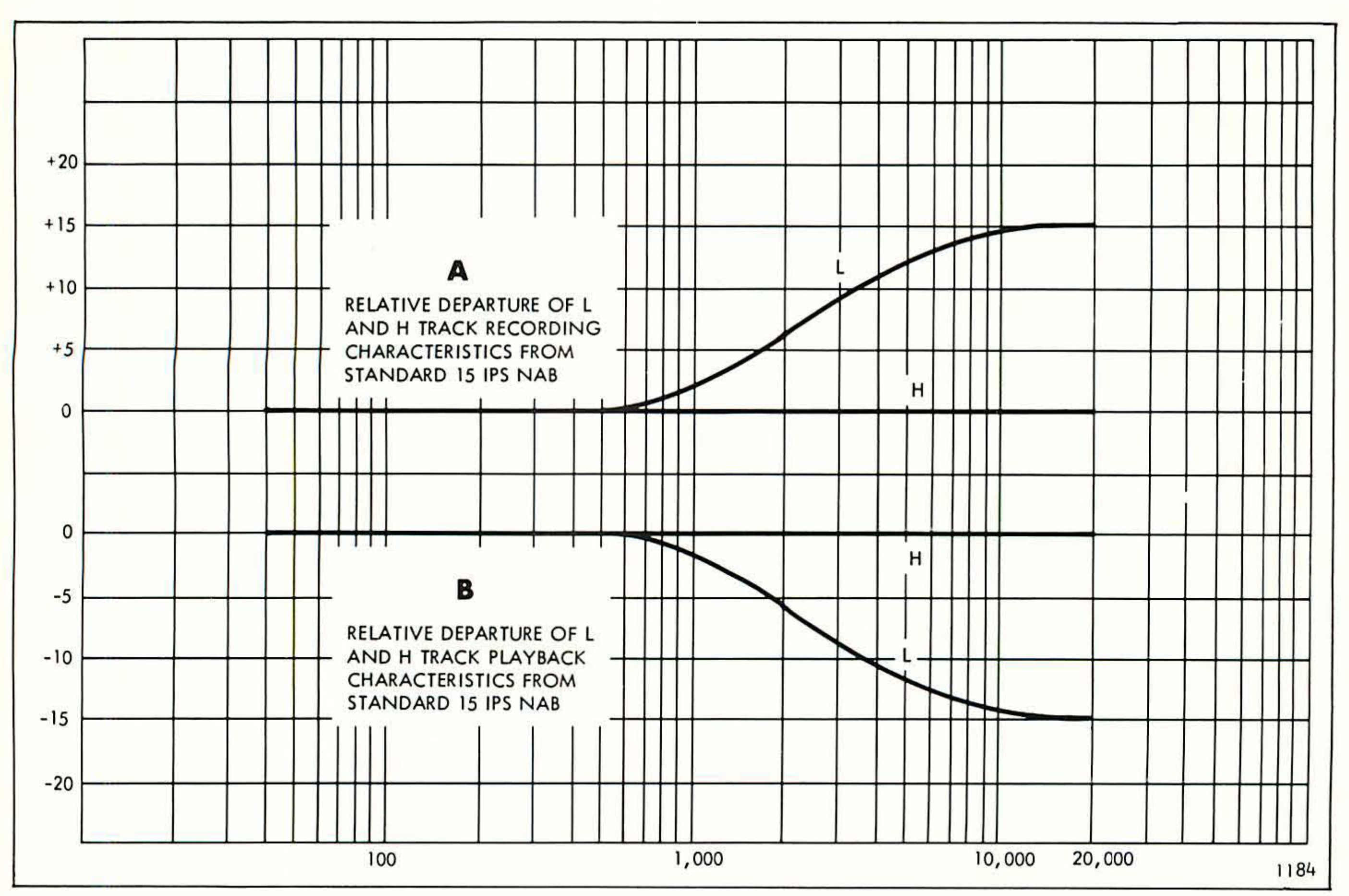



Figure 2. Dynatrack Characteristics

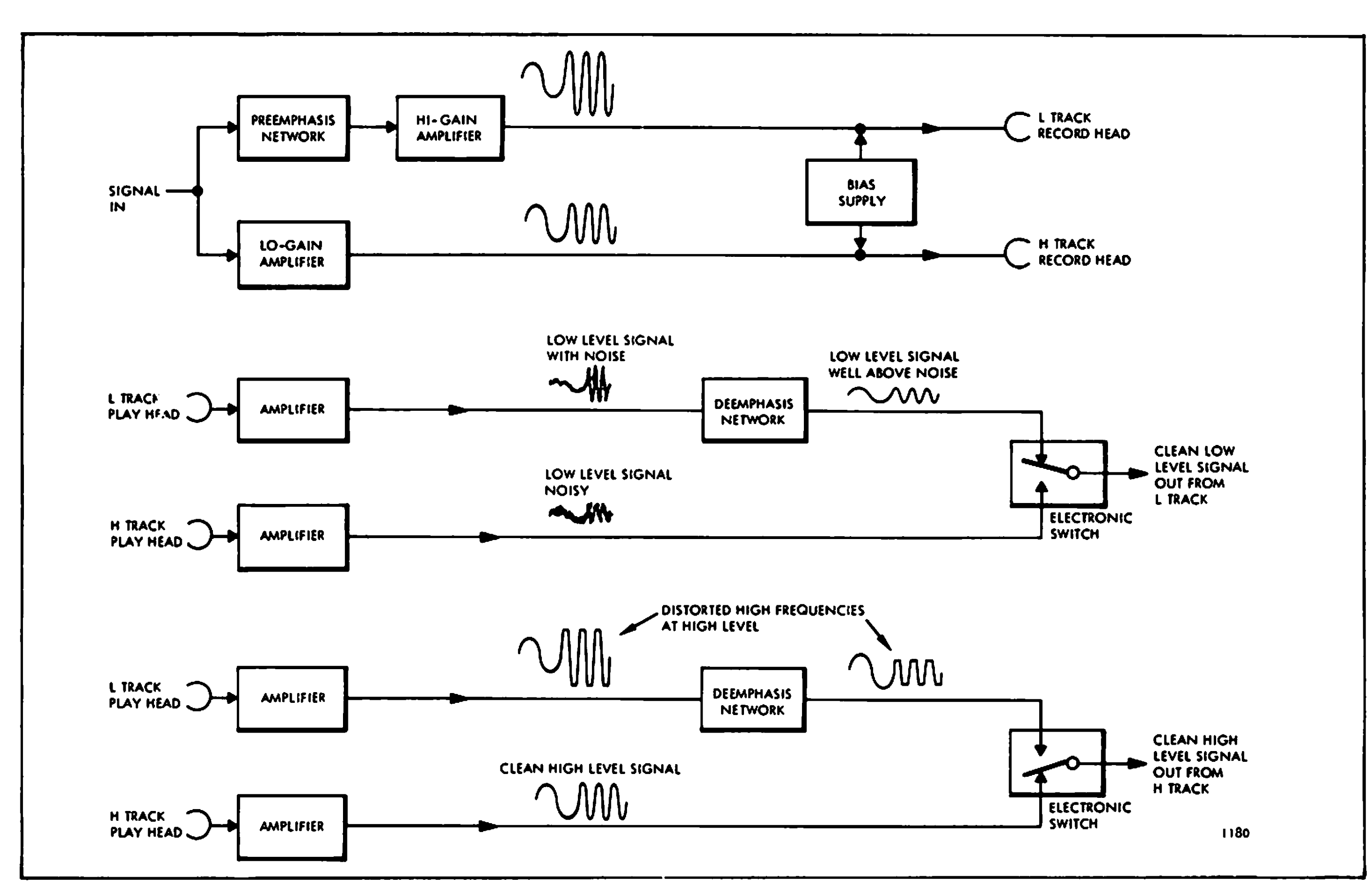



Figure 3. Dynatrack H and L Channels

Selection of the proper playback track is dependent upon an electronic circuit which is fully automatic and completely silent in switching from one track to the other. The circuitry is designed and calibrated so that the signals from the L track are reproduced up to the point where the signal approaches 1% total harmonic distortion. At this point the output is taken from the H track, which has a signal recorded as much as 15 db below the 1% distortion point. Now, the level of the output signal can continue rising until it reaches the normal maximum, as indicated on the VU meter. This track transfer from L to H occurs much faster than the ear can detect so that sudden steep transients of high volume are cleanly reproduced without any audible distortion. When the signal on the L track drops below 1% distortion, the electronic circuit automatically transfers the signal from the H track back to the L track in approximately 30 milliseconds.

NOTE

No switching occurs on signals below 400 Hz, as tape noise rarely intrudes on signals below this frequency.

To equalize playback levels of both the L and H tracks, there is a de-emphasis network in the play circuit of these preamplifiers, providing the exact opposite of the preemphasis network in the recording circuitry (figure 2B).

A continuous visual check as to which track is being reproduced is provided by the pilot lamp in the L track preamplifier section of the electronic assembly. When the lamp is glowing, the L track is being reproduced; when the lamp is out, the H track is being fed to the output.

This automatic track transfer system is a completely electronic system; no mechanical relays, switches, etc., are used (figure 4). All electronics are solid-state, assuring long term reliability and accuracy of performance. Also, as the Dynatrack recording technique is completely electronic, there is no noise involved at any frequency, and the system is completely undetectable in use -- except for the increased signal-to-noise ratio and the far greater dynamic range of tapes recorded and reproduced on the 3M Brand Professional Audio Recorder.

## ISOLOOP TAPE TRANSPORT

The tape transport mechanism of the 3M Brand Professional Audio Recorder is derived from designs used in instrumentation recorders, where standards of timing accuracy, and wow and flutter are even more demanding than

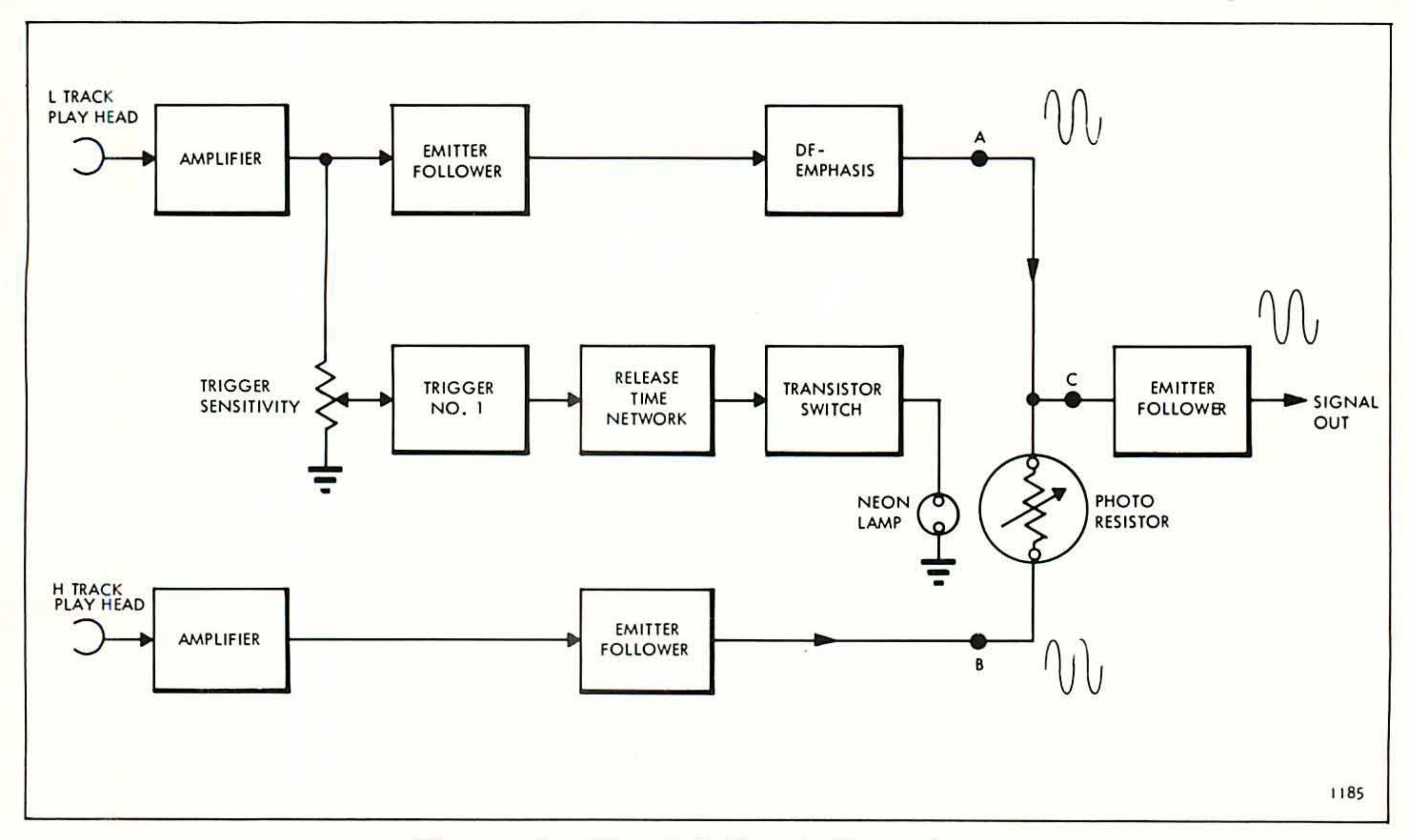



Figure 4. H and L Track Transfer

they are in audio recording. The heart of the patented Isoloop tape drive is the differential capstan, which maintains a constant tape tension within the drive and positive contact of the tape against the heads (figure 5). In addition, the unsupported tape path is extremely short in comparison to standard design tape recorders. This short path reduces longitudinal oscillation to a new low and eliminates the need for a series of tape guides to maintain a proper tape path.

The tape tension required to minimize flutter and hold the tape against the heads is generated within the closed loop by the differential drive capstan. The tape drive surface of the capstan is divided into regions of two different diameters. The incoming idler roller is contoured so as to press the tape firmly into the matching "grooves" (of the smaller diameter) of the capstan. The outgoing idler roller is shaped so as to press the tape firmly against the "ridges" (of the larger diameter) of the capstan. This differential of capstan diameters constantly tries to extract more tape than is being fed into the loop and creates the necessary tension by means of the slight elasticity of the tape itself. This tape tension is always kept safely within its elastic limits.

The Isoloop tape drive, short tape path, and flywheel driven capstan all aid in reducing the flutter of the tape transport to approximately half that found in other professional tape drive systems.

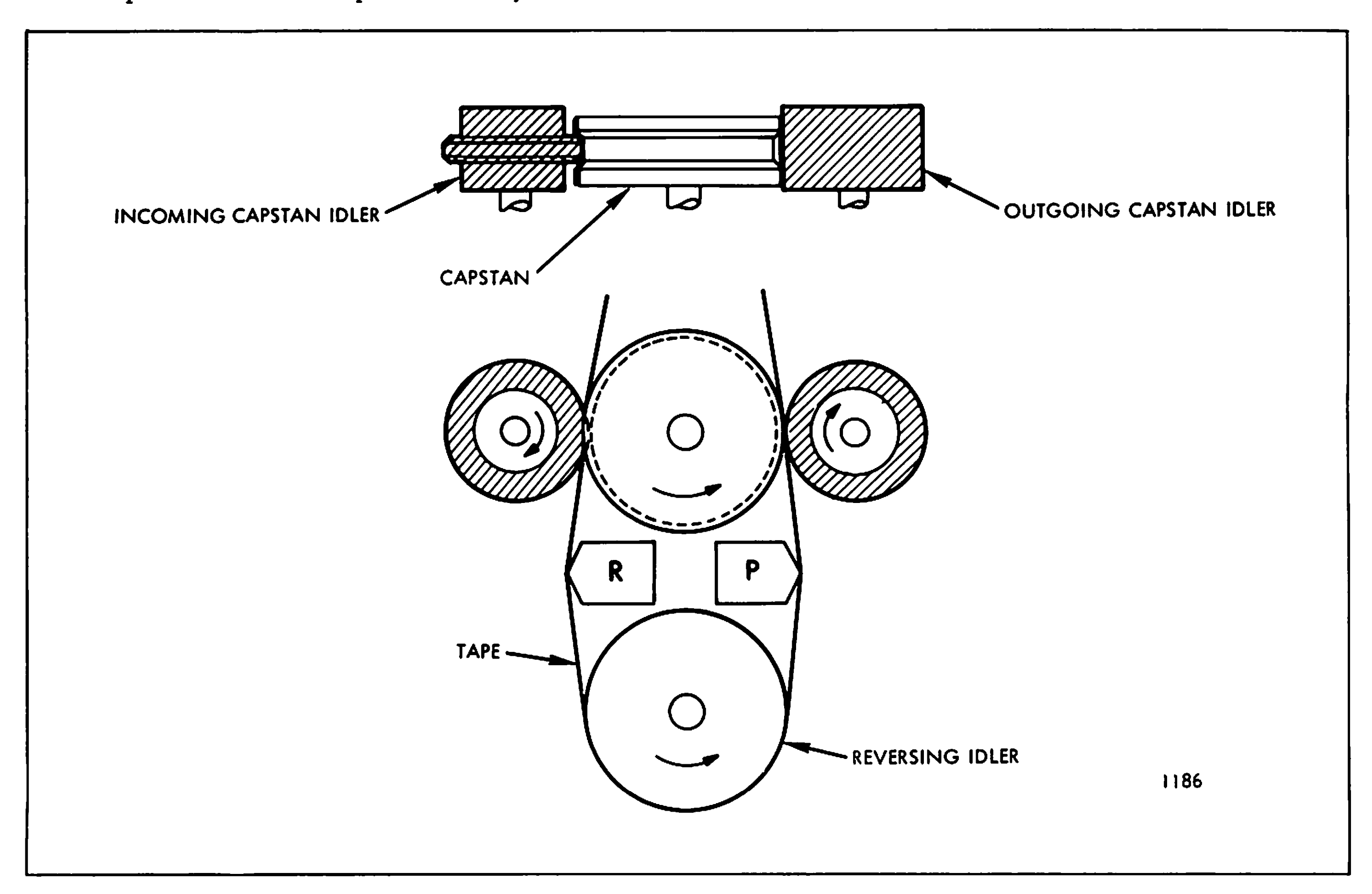



Figure 5. Isoloop Tape Drive

## PHYSICAL DESCRIPTION

The system equipment can be supplied in almost any configuration required. It is available in several standard console configurations, as a portable system contained in its own portable case, or unmounted for installation in a 19-inch equipment rack (figure 6). Special consoles and cabinets are available on special order. Systems are engineered to fit the user's requirements: the number and type of channels, and the mounting and installation to fit the application. Complete installation instructions for each of the standard models is given under Installation.

Physically, each system consists of a tape transport and electronics as required. This may be 1 to 8 channels of NAB electronics, 1 to 4 channels of Dynatrack electronics or a combination of both. Any system can be expanded up to the maximum capacity simply by adding additional channels of electronics and changing the tape width and magnetic heads.

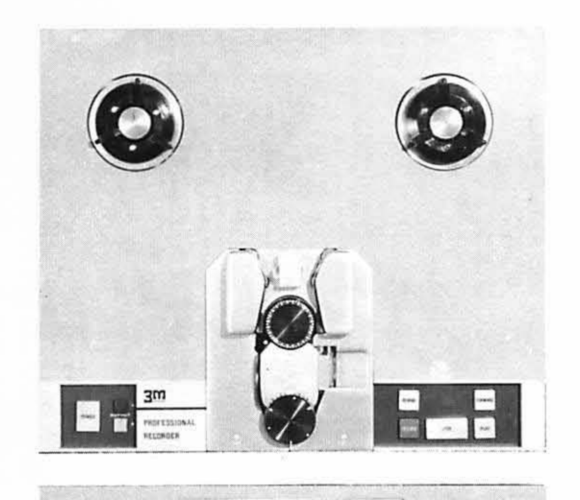
## EQUIPMENT DESCRIPTION

Each tape recorder system will have a tape transport (figure 7) and an electronics assembly (figure 8) for each record and play channel. Also, a system may have any of the accessories listed in table 1.

The basic tape transport is the same in all systems; the only difference is in the tape width, magnetic heads, and capstan speed. The tape guides and magnetic heads are installed as kits depending upon the number and type of channels. The transport is available with either of two capstan sizes. One of these kits accommodates 1/4-inch or 1/2-inch tape. It is normally furnished in machines that will never be expected to use tapes wider than 1/2 inch. The other kit is intended for machines using 1-inch tape. While 1/2-inch and 1/4-inch tape can be run on the 1-inch capstan, the latter is less convenient for threading and editing 1/4-inch or 1/2-inch tape.

The electronics assembly contains the electronics required for a single channel of NAB or Dynatrack record and playback. Each electronics assembly contains a plug-in power supply and meter (the meter may be in a remote location), controls and indicators, and as many as seven plug-in circuit boards. There is an input and an output transformer located behind the control panel. All electrical connections for each channel are made on the rear panel of the electronics assembly.

The electronics assembly plug-in circuit boards are numbered 1 through 9 on the board handle indicating the slot that the board goes in. Slot 2 is always empty and the meter and power supply is slot 5. To change the electronics assembly between NAB and Dynatrack it is only necessary to change the boards in slot 3 and 8. The NAB boards have an N on their handle and the Dynatrack boards have a D on their handle. It is also necessary, when changing between NAB and



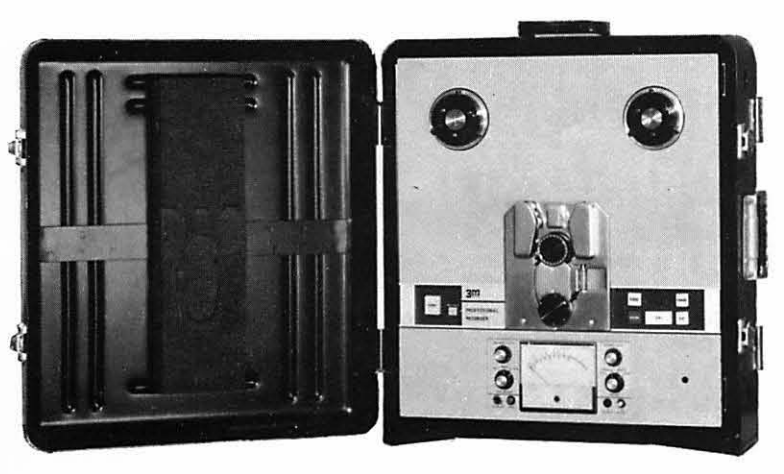
## UNMOUNTED

Consists of tape transport and electronics. Transport is complete with required magnetic heads and ready for horizontal or vertical mounting. Electronics are individual modular panels and provide either standard NAB and/or Dynatrack functions.



## CONSOLE

Transport and electronics mounted within a console cabinet.



## PORTABLE

Components mounted within rugged shock mounted portable cases.

Figure 6. 3M Brand Professional Audio Tape Recorder Systems

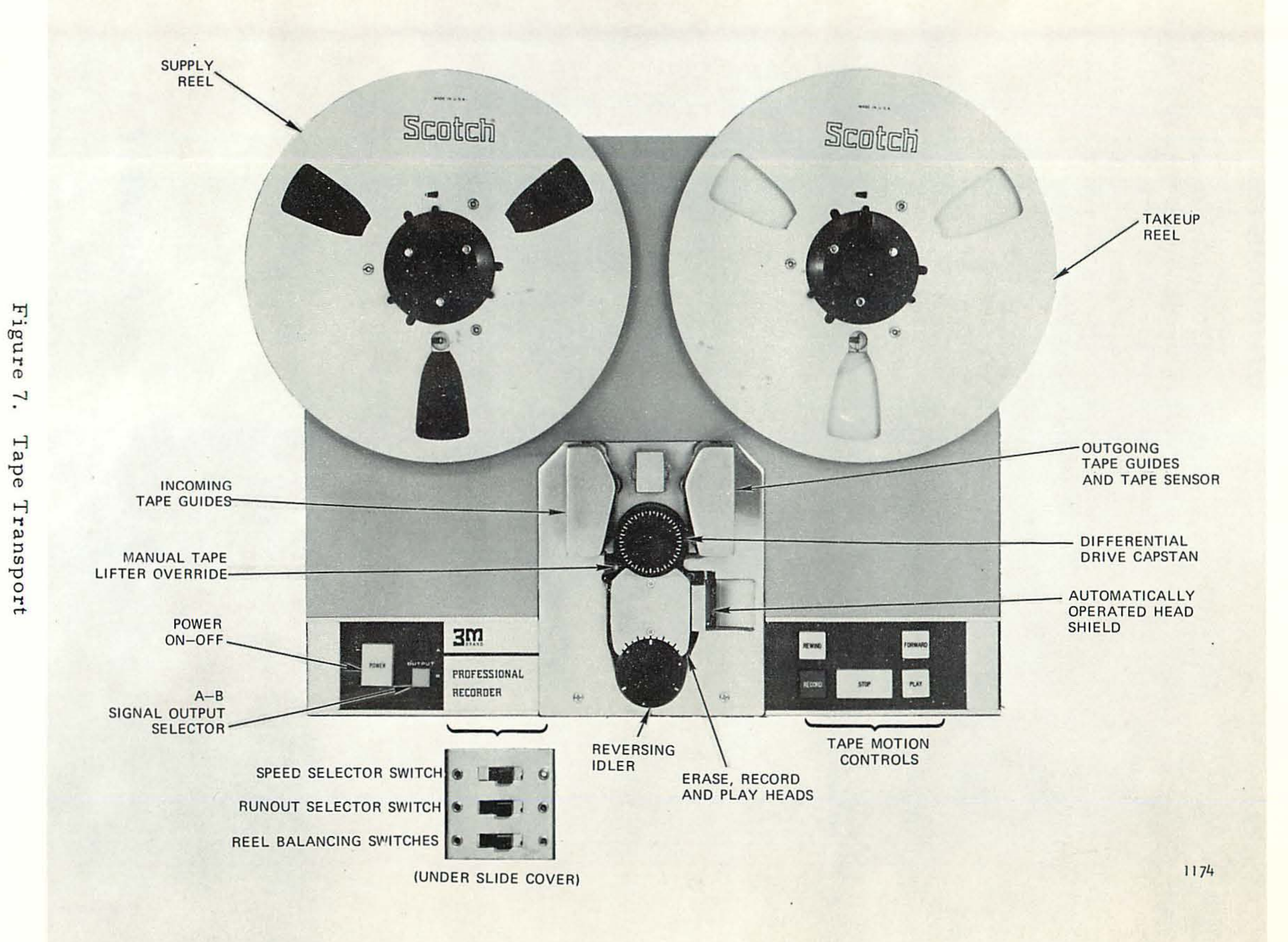



Figure 7. Tape Transport

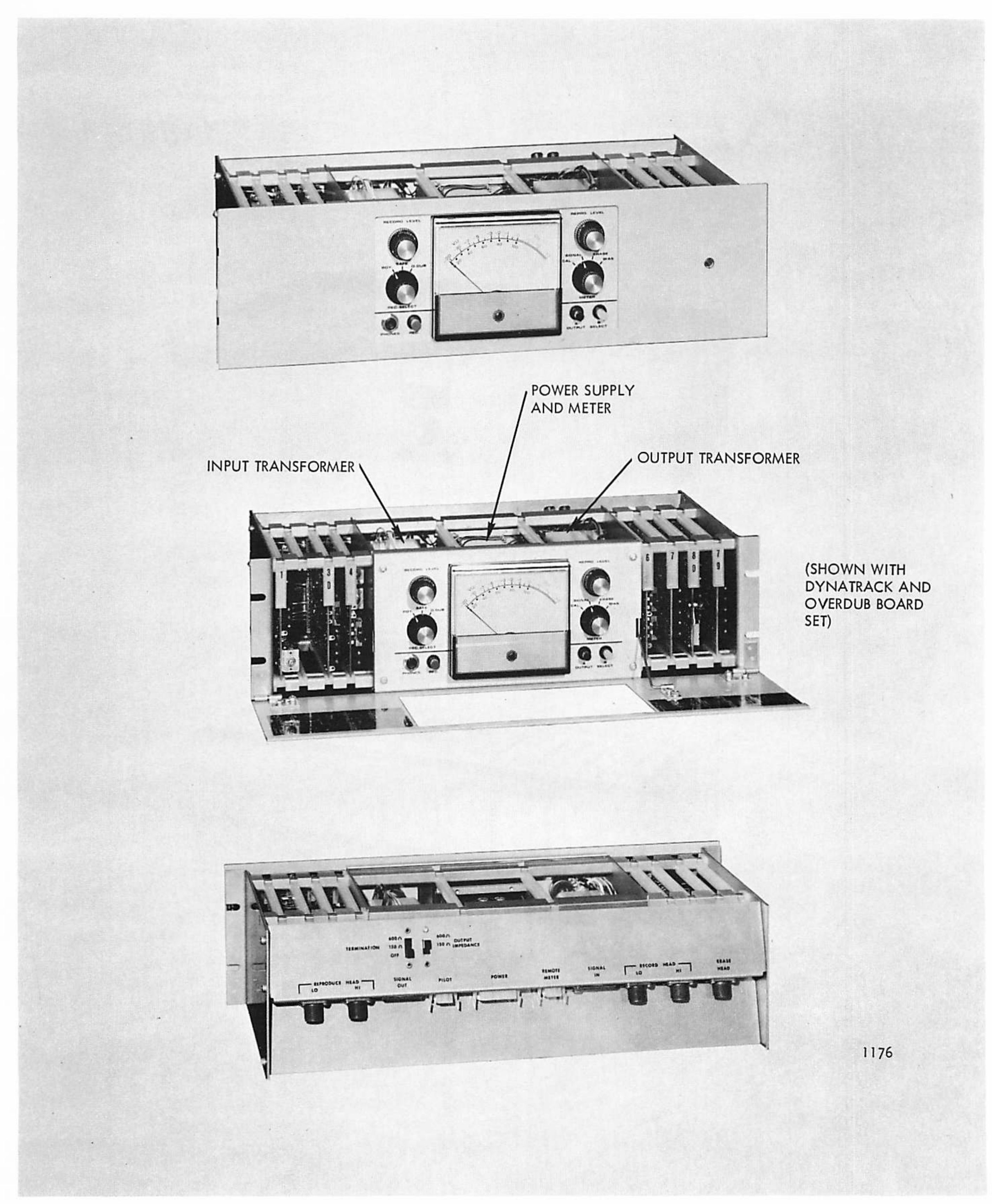



Figure 8. Electronics Assembly (One Channel)

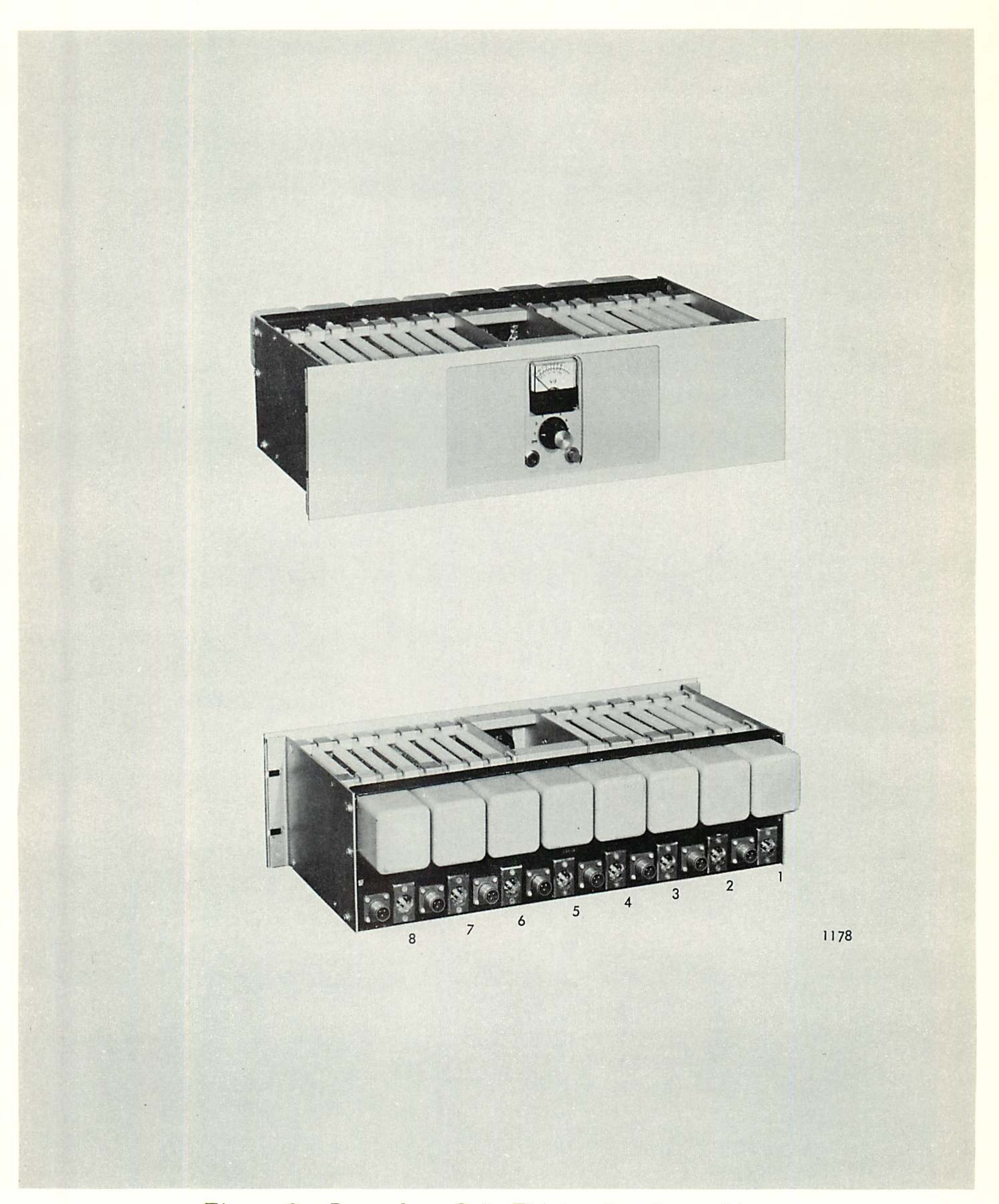



Figure 9. Reproduce Only Electronics Assembly

Dynatrack, to change the cabling on the rear panel of the electronics assembly and possibly the magnetic heads and tape width of the transport.

The Professional Audio Recorder is available as an all reproduce (figure 9), or combination of record-reproduce, and reproduce only system. The reproduce only electronics are contained in a special electronics assembly. Two circuit boards per channel are required. There is a head cable input connector, output transformer, and signal output connector for each channel on the rear panel. The front panel contains a meter, selector switch, phone jack, and power on indicator.

The tape transport operates at either of two electrically selectable tape speeds. The most common speeds are 7-1/2 and 15 ips; however, other speeds are available. The electronics equalization is automatically switched to the selected tape speed. The standard transport is equipped to accommodate 10-1/2 inch reels with NAB hub; however, other hubs and reel capacities are available.

The tape transport contains the tape motion controls and tape handling controls; plus, it performs certain functions common to all of the electronic assemblies. It provides tape speed equalization control, the source of bias and erase frequency, the A-B transfer function, and control of the record function. The POWER button on the transport controls the power to the entire system. The electronics assembly contains all of the remaining controls, such as the record and reproduce level controls, and the meter control.

Table 1. 3M Brand Professional Audio Recorder Components

| COMPONENT | | | | DESCRIPTION |
|---|---|---|---|---|
| TAPE TRANSPORT | | | | |
| TAPE TRANSPORTS | Speeds (ips) | Capstan (inches) | Guides (inches) | |
| 23013B000-10 | 7 1/2, 15 | 1/2 | 1/4 | Complete tape transport less mounting hardware and head assemblies |
| 23013B000-11 | 7 1/2, 15 | 1/2 | 1/2 | |
| 23013B000-12 | 7 1/2, 15 | 1 | 1/4 | |
| 23013B000-13 | 7 1/2, 15 | 1 | 1/2 | |
| 23013B000-14 | 7 1/2, 15 | 1 | 1 | |
| 23013B000-17 | 15, 30 | 1/2 | 1/4 | |
| 23013B000-18 | 15, 30 | 1/2 | 1/2 | |
| 23013B000-19 | 15, 30 | 1 | 1/4 | |
| 23013B000-20 | 15, 30 | 1 | 1/2 | |
| 23013B000-21 | 15, 30 | 1 | 1 | |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENT | | | DESCRIPTION |
|---|---|---|---|
| BASIC TAPE TRANSPORT | | | |
| 23013B990 | | | Consists of the basic tape transport less the tape width determining elements, tape speed kits, head assemblies, and mounting hardware. |
| TAPE SPEED KIT (Capstan Motor & Flywheel Set) | | | |
| | Speeds (ips) | Power (~) | |
| 23013B940 | 3 3/4, 7 1/2 | 60 | Consists of capstan motor assembly, including capacitor and connector mounted on swing bracket, capstan flywheel, and resistor R63. |
| 23013B945-1 | 7 1/2, 15 | 60 | |
| 23013B945-2 | 7 1/2, 15 | 50 | |
| 23013B950-1 | 15, 30 | 60 | |
| 23013B950-2 | 15, 30 | 50 | |
| 23013B955 | 30, 60 | 60 | |
| 23013B960 | 60, 120 | 60 | |
| TAPE WIDTH KIT (Guides & Reel Hubs) | | | |
| | Tape (inches) | Capstan (inches) | |
| 23013A910 | 1/4 | 1/2 | Consists of ingoing and outgoing fixed tape guides, and NAB hub. |
| 23013A915 | 1/2 | 1/2 | |
| 23013A930 | 1/4 | 1 | |
| 23013A935 | 1/2 | 1 | |
| 23013A920 | 1 | 1 | |
| BRAKE KITS | | | |
| 23013A970 | Flywheel brake (capstan) (high speed transports) | | Shortens mode change time. |
| 23004A900 | Failsafe brake (reels) | | Prevents tape spill if power fails. |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENT | | | DESCRIPTION |
|---|---|---|---|
| **CAPSTAN AREA PARTS** | | | |
| 23013A900 | (1/4-1/2 inch) | | Capstan, reversing idler, capstan idlers, idler arms, tape lifter, head gate, trim covers and capstan assembly (shaft, housing, and bearings). |
| 23013A905 | (1/2-1 inch) | | |
| **HEAD ASSEMBLIES** | | | |
| | Tape (inches) | Tracks | |
| 23000A020-1 | 1/4 | 1 | Includes erase, record, and playback head stacks mounted on bolt-on precision plate, with single 42-pin connector. |
| 23000A020-2 | 1/4 | 2 | |
| 23000A020-5 | 1/2 | 2 | |
| 23000A020-3 | 1/2 | 3 | |
| 23000A020-4 | 1/2 | 4 | |
| 23000A020-6 | 1 | 3 | |
| 23000A020-7 | 1 | 4 | |
| 23000A020-8 | 1 | 6 | |
| 23000A020-9 | 1 | 8 | |
| **PREPLAY HEADS** | | | |
| | Tape (inches) | Tracks | |
| 23000A900-1 | 1/4 | 1 | Monitors tape ahead of reproduce heads to drive variable-pitch record cutting lathe. |
| 23000A900-2 | 1/4 | 2 | |
| 23000A900-4 | 1/2 | 3 | |
| 23000A900-5 | 1/2 | 4 | |
| 23000A900-6 | 1 | 4 | |
| 23000A900-7 | 1 | 8 | |
| **TRANSPORT COVER PLATES** | | | |
| 23013A023 | 19-inch (-1 for 10 1/2-inch reel, -2 for 12-inch reel) | | |
| 23000A005 | 24-inch (10 1/2-inch reel) | | |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENT | DESCRIPTION |
|---|---|
| 3 1/2-INCH BLANK PANEL | |
| 83-1360-0166 | This panel is installed to provide space above rack-mounted transports for reel hangover. |
| 5 1/4-INCH BLANK PANEL | |
| 23028A046 | Used in place of an electronics assembly. |
| PORTABLE TRANSPORTER CASES | |
| 23028A100-1 | Fits transport with 1 inch capstan. |
| 23028A100-2 | Fits transport with 1/2-inch capstan plus one channel of electronics. |
| ELECTRONICS ASSEMBLY | |
| ELECTRONICS ASSEMBLY | |
| 23059A010 | Consists of the basic electronics chassis assembly less all of the plug-in units. |
| ELECTRONICS ASSEMBLY BOARDS | These boards may be obtained as NAB channel set, Dynatrack channel set, or individually. Six of the boards are common; used for both NAB and Dynatrack. |
| NAB BOARD SET | |
| 23059A900 | |
| Bias and Erase Amplifier (1) | |
| NAB Erase Coupler (NAB only) (3) | |
| H and NAB Record (4) | |
| Meter/Power Supply (5) | |
| Line Driver Amplifier (6) | |
| Overdub Preamplifier (7/9) | |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENTS | DESCRIPTION |
|---|---|
| DYNATRACK BOARD SET | |
| 23059A910 | |
| Bias and Erase Amplifier (1) | |
| L Record Amplifier (Dynatrack only) (3) | |
| H and NAB Record Amplifier (4) | |
| Meter/Power Supply (5) | |
| Line Driver Amplifier (6) | |
| L Preamp and Switch (Dynatrack only) (8) | |
| Overdub Preamplifier (7/9) | |
| BIAS & ERASE AMPLIFIER CIRCUIT BOARD | |
| 23059A020 | Part of the record circuit — installed in slot 1. |
| NAB ERASE COUPLER CIRCUIT BOARD | |
| 23059A030 | Part of the NAB record circuit — installed in slot 3 in place of Dynatrack record board, 23059A130. |
| L RECORD AMPLIFIER CIRCUIT BOARD | |
| 23059A130 | Part of the Dynatrack record circuit — installed in slot 3. |
| H AND NAB RECORD AMPLIFIER CIRCUIT BOARD | |
| 23059B040 | Part of the record circuit — installed in slot 4. |
| METER AND POWER SUPPLY ASSEMBLY | |
| 23059A050 | Power supply and meter — installed in slot 5. |
| LINE DRIVER AMPLIFIER CIRCUIT BOARD | |
| 23059A060 | Part of the reproduce circuit — installed in slot 6. |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENTS | DESCRIPTION |
|---|---|
| H AND NAB PREAMPLIFIER CIRCUIT BOARD | |
| 23059A170 | Part of the reproduce circuit -- installed in slot 7. |
| L PREAMPLIFIER AND SWITCH CIRCUIT BOARD | |
| 23059A140 | Part of the Dynatrack reproduce circuit -- installed in slot 8. |
| H AND NAB PREAMPLIFIER WITH OVERDUB | |
| 23059B090 | Same as slot 7 board but with overdub feature -- may be used in slot 7 or 9. |
| NAB CONVERTER | |
| 23059A920 | This board is required only when a Dynatrack Electronics Assembly is converted to NAB operation. |
| POWER SUPPLY WITHOUT METER | |
| 23059A250 | Power supply used with remote meters -- installed in slot 5. |
| CABLES | |
| TRANSPORT-TO-ELECTRONICS POWER AND CONTROL CABLES | |
| 23028A055 4 channel | 5-foot cable, 15-pin connectors. |
| 23028A065 8 channel | 5-foot, Y-cable, 15-pin connectors. |
| HEAD CABLES | |
| 23000A010-1 1 track<br>23000A010-2 2 tracks<br>23000A010-3 3 tracks<br>23000A010-4 4 tracks<br>23000A010-8 8 tracks | This cable is about 66-inches long, and connects between the head plate on the transport and each channel of electronics. There is a play (P), record (R), and erase (E) head cable for each track. |

Table 1. 3M Brand Professional Audio Recorder Components (Cont'd)

| COMPONENT | DESCRIPTION |
|---|---|
| ACCESSORIES | |
| REMOTE CONTROL (with 5-foot cable) | |
| 23017A000 | This unit provides remote control of the RECORD, PLAY, STOP, REWIND, FORWARD, and A-B OUTPUT transfer functions. |
| REMOTE CONTROL EXTENSION CABLE | |
| 23017A010 | A 25-foot extension cable for the remote controls. |
| EDIT FOOT SWITCH | |
| 23000A950 | Permits hand-free spill/standby/ wind for rapid tape editing. |
| EXTENDER BOARD | |
| 23059A110 | Extender board for circuit boards in the electronics assembly. |
| REPRODUCE ONLY ELECTRONICS | |
| 23059A960-1 4 channel NAB | Includes a chassis assembly, a preamplifier and line amplifier for each channel. |
| 23059A960-2 8 channel NAB | |
| FILM SYNC ELECTRONICS | |
| Chassis Assembly and Circuit Board Set | |
| 23059A950 | Fits 5 1/4 x 19 inch rack space. |
| Bias and Erase Amplifier Circuit Board (1) | |
| 23059A020 | Slot 1 Board |
| Erase Coupler Board (3N) | |
| 23059A030 | Slot 2 Board |
| Film Sync Record Amplifier Board (3S) | |
| 23059A330 | Slot 3 Board |
| H and NAB Record Amplifier Board (4) | |
| 23059B040 | Slot 4 Board |

Table 1. 3M Brand Professional Audio Recorder Components (Concluded)

| COMPONENTS | DESCRIPTION |
|---|---|
| Meter and Power Supply Assembly | |
| 23059A050 | Slot 5 Assembly |
| H and NAB Preamplifier Board (7) | |
| 23059A170 | Slot 7 Board |
| Line Driver Amplifier Board (6) | |
| 23059A060 | Slot 6 Board |
| Film Sync Reproduce Board (9S) | |
| 23059A390 | Slot 9 Board |
| Film Sync Head Cable Set 23000A310 | |
| Film Sync Power Cable 23023A350 | |

## SPECIFICATIONS

Specifications for the 3M Brand Professional Tape Recorder are presented in table 2. These specifications are based upon operation in accordance with the procedures and conditions presented in this manual. Deviation from these procedures, use of other than recommended magnetic tapes, or modification of the equipment may result in degradation of the equipment performance. These specifications are subject to change without notice.

Table 2. Specifications

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| ELECTRONICS | |
| Signal-to-Noise Ratio: | For Dynatrack system employing 1/4-inch width of tape per channel (1 channel 1/4-inch tape; 2 channels 1/2-inch tape, etc.) at 15 ips tape speed based on peak record level of 3% THD and employing ASA weighting curve A: Greater than 80 db.<br><br>For standard recording systems with NAB equalization measured from 3% THD level at 400 cycles to noise, on full spectrum basis: |

| Tracks No. | Tape Width Inches | Track Width Mils | 15 or 7 1/2 ips Speed db |
|---|---|---|---|
| 1 | 1/4 | 0.234 | 67 |
| 2 | 1/4 | 0.075 | 62 |
| 2 | 1/2 | 0.200 | 66 |
| 3 | 1/2 | 0.100 | 63 |
| 4 | 1/2 | 0.070 | 62 |
| 3 | 1 | 0.250 | 67 |
| 4 | 1 | 0.180 | 66 |
| 6 | 1 | 0.095 | 63 |
| 8 | 1 | 0.070 | 62 |

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| Tape Type: | Specifications are based on use of Scotch Brand Dynarange recording tapes 201, 202, or 203. Adjustable bias and equalization permits accommodation of a wide range of tape characteristics. |
| Equalization: | The Dynatrack system matches the NAB curve of frequency versus distortion for 15 ips above a designed reference level. The weighted 3M equalization curve is followed at low level for extended dynamic range.<br><br>Standard machines are normally equalized for NAB 15 and 7 1/2 ips speeds. Equalizers are automatically switched when the tape speed is changed. Other forms of equalization may be provided on order. |

Table 2. Specifications (Cont'd)

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| Frequency Response: | 15 ips NAB equalization<br>±1 db 40 to 15,000 cycles<br>±2 db 30 to 15,000 cycles<br>7 1/2 ips NAB equalization<br>±1 db 50 to 12,000 cycles<br>±2 db 30 to 15,000 cycles |
| Phasing: | Signal input to output polarity is maintained on all channels. |
| Channel Separation: | Channel to channel crosstalk separation is greater than 50 db at 500 cycles (zero VU). |
| Electronics Input: | 20,000 ohm balanced or unbalanced line. -20 dbm to +8 dbm signal on 600-ohm bus. |
| Electronics Output: | Feed to 150 or 600-ohm line, terminated or unterminated at levels of +4 or +8 dbm. Convenient switch transfers output directly to monitor loud-speaker line with peak power capability of 1 watt to an 8-ohm load. Other operating levels are available on special order. |
| Bias and Erase Oscillator: | Master oscillator on tape transport supplies 120 kHz, through a low impedance bus to the individual bias and erase power amplifiers for each channel. |
| Degree of Erasure: | A 1,000 cycle signal at 3% distortion level is reduced 68 db or more by the erase head provided for NAB standard operation. |
| Power Input: | 110 to 135 volts, 60 cycles. Internally regulated power supplies make transformer tap changes unnecessary over this range. Optional 50 cycle power. |

Table 2. Specifications (Cont'd)

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| Electronic Controls: | Operating controls provided on front panel of each electronics module: RECORD LEVEL and REPRO LEVEL gain controls with positive mechanical shaft locks. REC SELECT switch (RDY., SAFE, O. DUB), METER switch (CAL., SIGNAL, ERASE, BIAS), OUTPUT SELECT pushbutton (A or B), REC. (record) warning pilot lamp, and PHONES jack. |
| MECHANICAL | |
| Speeds: | 7 1/2 and 15 ips standard. 3 3/4 and 7 1/2 ips or 15 and 30 ips available on special order. |
| Tape Width: | Normally 1-, 1/2-, or 1/4-inch tape. |
| Reel Sizes: | NAB hub. Adaptable to CCIR or small plastic reel hubs. Standard reel 10 1/2-inch diameter. Alternatively, 11 1/2-inch diameter reels can be furnished for CCIR applications. Large 14-inch reel diameter capability is available. |
| Flutter: | Speed (ips) / Flutter Band (Hz) / Maximum % Flutter (rms):<br>15 / 0.5 - 300 / 0.04%<br>15 / 0.5 - 5000 / 0.05%<br>7 1/2 / 0.5 - 300 / 0.07%<br>7 1/2 / 0.5 - 5000 / 0.09%<br>All measurements of flutter are made by recording a tone on the machine under test, rewinding the tape and measuring flutter on replay. Maximum additive phase case accepted as maximum flutter. |
| Start Time: | 0.5 second to stable motion in play or record mode for 1/4-inch or 1/2-inch tape, 1.0 second for 1-inch tape. |
| Stopping Time: | 0.8 second from play or record mode. |
| Timing Accuracy: | ±0.10% |
| Rewinding Time: | 60 seconds for 2400 feet. |

Table 2. Specifications (Cont'd)

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| Weight/Dimensions: | Tape transport and electronics assembly have standard 19-inch wide rack mounting panels with commercial notching. |
| Console: | 66 1/2 inches high (with four electronics modules), 26 3/4 inches wide, 24 1/4 inches deep. Approximate weight (complete) 300 lbs. |
| Tape Transports: | 15 3/4-inch panel. Weight approximately 65 pounds. |
| Electronics Assembly: | 5 1/4-inch panel. Weight approximately 15 pounds per assembly. (One electronics assembly required for each channel recorded: NAB or 3M Dynatrack channel). |
| Portable: | Complete in two drawn aluminum cases. Electronics case: 21 inches long, 11 1/4 inches wide. 18 inches high. Weight: approximately 85 pounds with three electronics modules. Tape transport case: 21 inches long, 12 inches wide, 18 inches high. Weight approximately 85 pounds. |
| Tape Transport Controls: | All are inoperative until tape is placed in the operating path which activates the controls and illuminates the STOP button. PLAY button starts tape in motion at running speed selected with HI-LO switch. May be activated from any other mode including high speed FORWARD or REWIND through automatic stop sequence without damage to tape. RECORD is functional only when pressed with PLAY button. Any or all channels can be locked off to prevent accidental recording. FORWARD places tape in high speed forward and operates tape lifters. REWIND similarly places tape in rewind mode and operates tape lifters. STOP referses torque to brake tape dynamically. When tape stops, braking torque is removed and slight holding torque is applied to prevent tape slack. |

Table 2. Specifications (Concluded)

| CHARACTERISTICS | SPECIFICATIONS |
|---|---|
| Optional Console Electronics Mounting: | Electronics modules can be mounted below the tape transport in the console cabinet. The volume level (VU) meters are then mounted side-by-side on a single panel just above the tape transport. |
| Editing Foot Switch: | Used during tape editing to free operator's hands for splicing tape. Permits starts, stops, and intentional tape "spills" as required for rapid editing. |

# INSTALLATION

## RECEIPT INSPECTION

The 3M Brand Professional Audio Recorder was inspected, completely checked out, and adjusted before leaving the factory. Immediately upon receipt, inspect the equipment for any shipping damage. If any damage is noticed, notify the carrier immediately. If everything is normal, proceed with the installation.

## GENERAL

As previously described, the system comes in three basic models: console, portable, and rack mounting. Console models are completely connected and ready for operation when unpacked and the power and signal connections are made. The portable models require, in addition to the power and signal connections, interconnecting cables between the tape transport and electronics. The rack mounting models require the same electrical connection as the portable model; in addition, they must be installed in a 19-inch equipment rack.

This section contains installation instructions for each of the three models, plus instructions for each of the standard accessories.

## LOCATION CONSIDERATIONS

The tape recorder system can be installed in almost any location as long as reasonable judgement is used. The system should not be installed in an extremely dusty or damp location. Strong magnetic fields should be avoided, such as from power transformers and tape degaussers. The tape recorder can probably stand high temperatures much better than its human operator; however, if the recorder is to be installed in an equipment rack, it should not be mounted above a chassis with vacuum tubes or anything which generates a large amount of heat.

The tape recorder system can be remotely controlled. The standard remote control cables are 5 and 25 feet long; however, longer cables can be used.

## CONSOLE MODEL INSTALLATION

Console models are shipped from the factory ready for operation. They are crated according to standard commercial practices, depending upon their destination. In some cases, the crating may be extensive and the receiver must be careful when unpacking not to damage the equipment or discard any separately packaged accessories. When the equipment is uncrated and located in its operating position, it only requires power and signal connections to be ready for operation;

plus connection of some accessories. Instructions for making these connections are given in the following paragraphs. Dimensions of the standard console models are given in figure 10.

## RACK (OR CUSTOM) MOUNTING

For rack mounting or custom installations the equipment and interconnecting cables are shipped as separate items ready for installation into a 19-inch equipment rack. Figure 11 gives the outline dimensions. Figure 12 illustrates a typical rack mounting installation. Cable connections and signal interface information is presented in the following paragraphs of this section.

The electronics assemblies and transport are packaged according to commercial practices. In addition, the transport is contained in a wooden shipping crate. To remove the transport from the wooden shipping crate, pry the top of the crate off. (It is nailed on.) There are cutouts at each end of the crate so that the transport can be grasped and lifted out.

Remove the tape transport from its shipping crate and install it as follows:

1. Position the capstan assist spring for vertical or horizontal mounting, as required. See figure 14.
2. To expose the transport mounting rails, it is necessary to remove the transport front cover plate. This is secured by two screws at the top of the transport and a lip at the bottom. Remove the two screws and slide the cover from the lip.
3. Attach the transport to the mounting rails, using eight 10-32 screws, washers, and lock washers; four on each side.
4. Reinstall the transport front cover plate.

The maximum distance between the transport and the electronics assembly is determined by the control and head cable lengths. From the transport connector to the first electronics assembly connector is 36 inches. The remaining connector loops are 12 inches apart. The head cable set is 66-inches long.

To install the electronics assembly, open the front cover and attach to the mounting rails with four 10-32 screws, washers, and lock washers. When the electronics assembly and transport are installed, make the cable connections as shown in figure 14, and listed under "Electrical Connections".

NOTE

Note that each of the cards in the electronics assembly has a number on it indicating the channel. This should be considered when arranging the electronics assemblies.

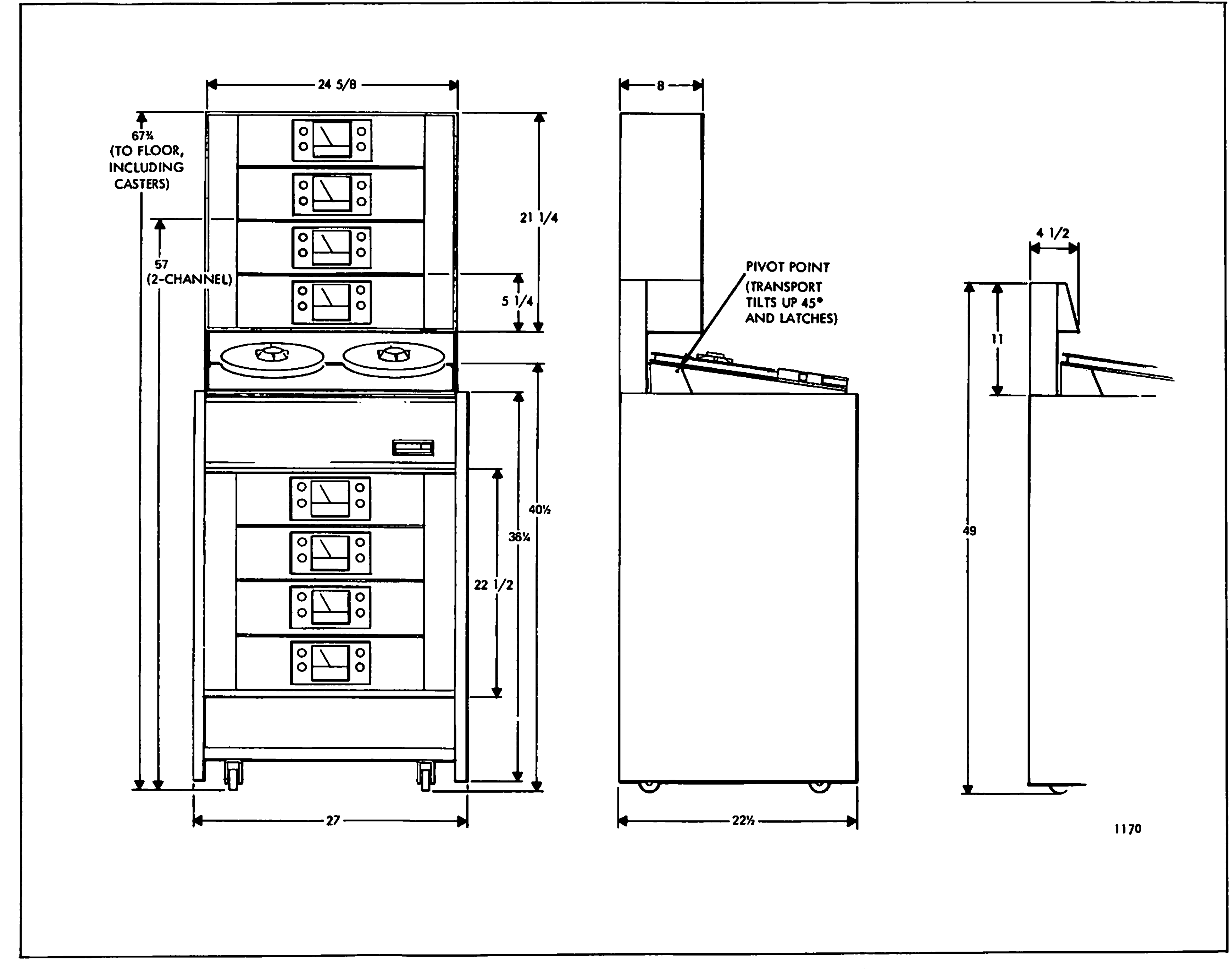



Figure 10. Outline Dimensions, Console Models

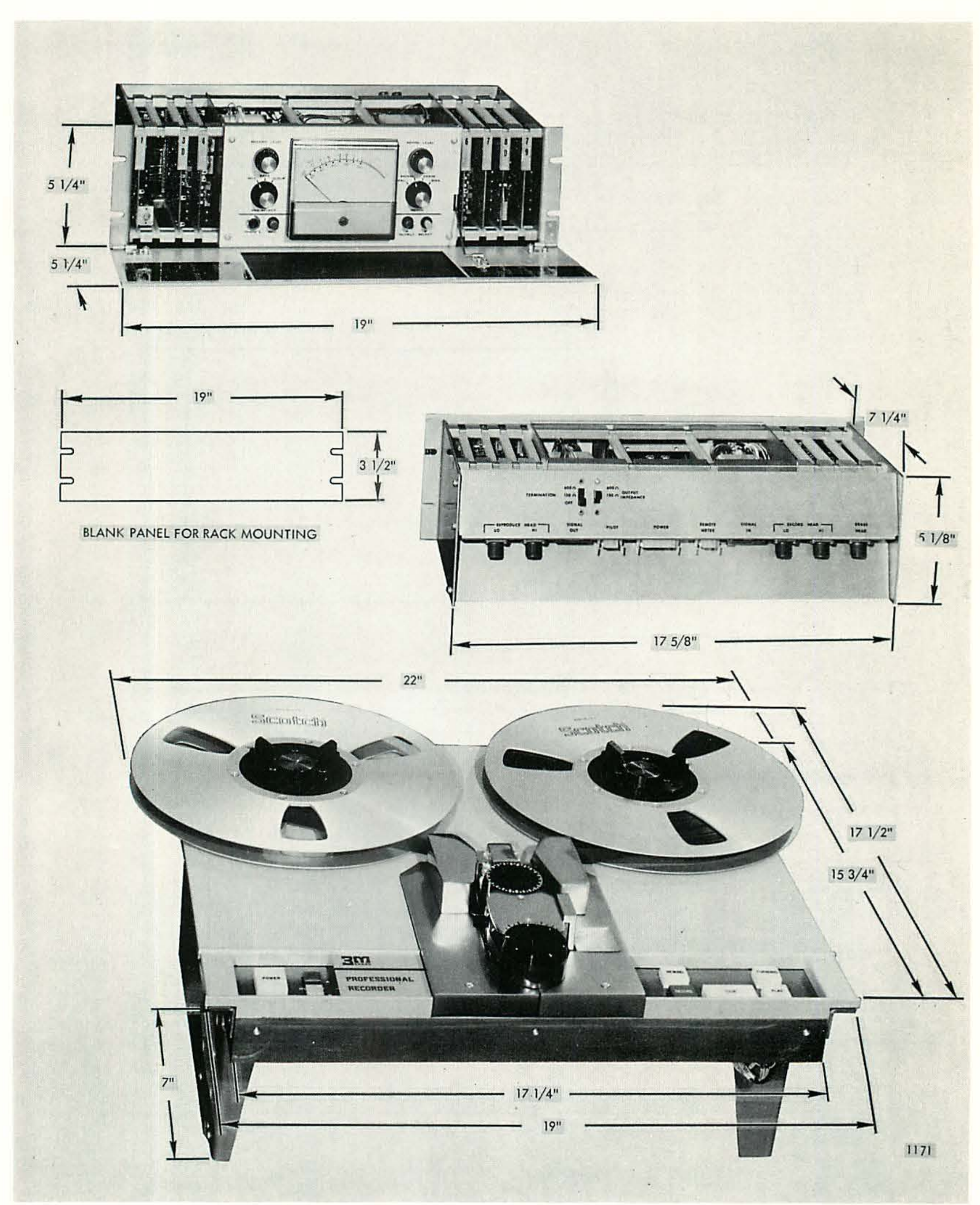



Figure 11. Outline Dimensions for Rack Mounting and Custom Installations

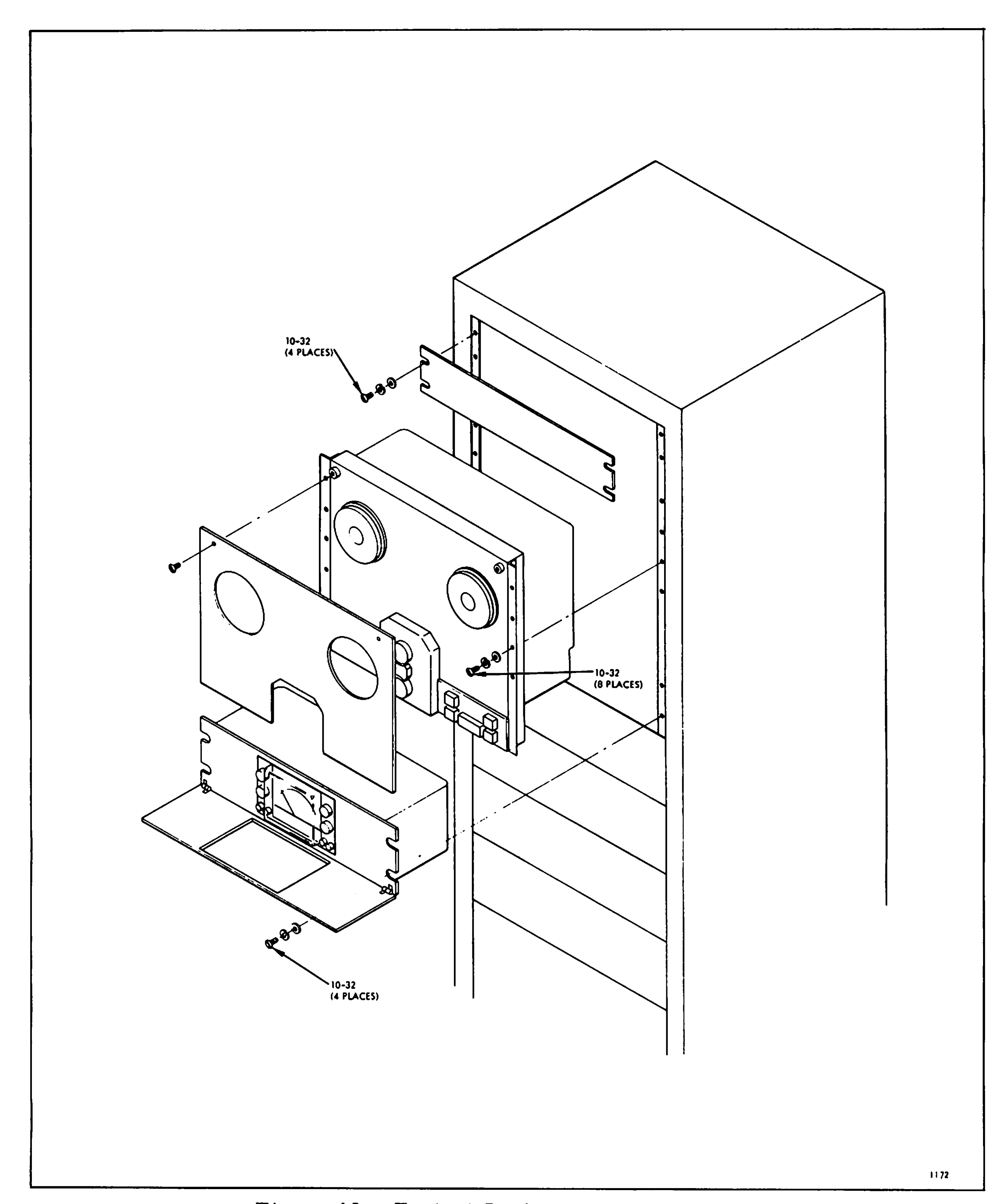



Figure 12. Typical Rack Mounting Layout

## PORTABLE MODEL INSTALLATION

Outline dimensions for the portable models are presented in figure 13. Of course, this equipment requires no physical installation. The equipment inside is attached to the case by shock mounts. Installation consists of removing the covers and making the electrical connections shown in figure 14 and listed under "Electrical Connections," as required. Also, connection of the capstan assist spring must be considered. This is also shown in figure 14. Signal interface information is present under that heading in this section.

## ELECTRICAL CONNECTIONS

As previously stated, the console model is shipped with all internal cabling connected. It only requires that the power cable and the external signal cables be connected, plus accessories such as the edit foot control and remote control. In addition, the rack mounting and portable models require connection of the power and control cable, and head cables between the transport and electronics assemblies. All of the cable connections are illustrated in figure 14, and each is detailed in the following paragraphs. Disregard any connection that does not apply to your equipment.

NOTE

> The circuit boards in each of the electronics assemblies have numbers on them indicating the magnetic head channels used to set up the electronics at the factory. These numbers should match when the equipment is installed. If they do not, the electronics should be readjusted before operation. For consistency, the channel numbers, the circuit board numbers, and head channel numbers should match throughout the system.

### Power and Control Cable

Connect the power and control cable to the ELECTRONICS receptacle on the tape transport and to the POWER receptacle on each of the electronics assemblies. There are two power and control cables used. Cable 23028A050 accommodates four electronics assemblies, and cable 23028A060 accommodates eight electronics assemblies. It is not necessary that all connector loops of the cable be connected. If only two electronics assemblies are used, for example, and cable 23028A050 is supplied, there will be two extra connectors on this cable.

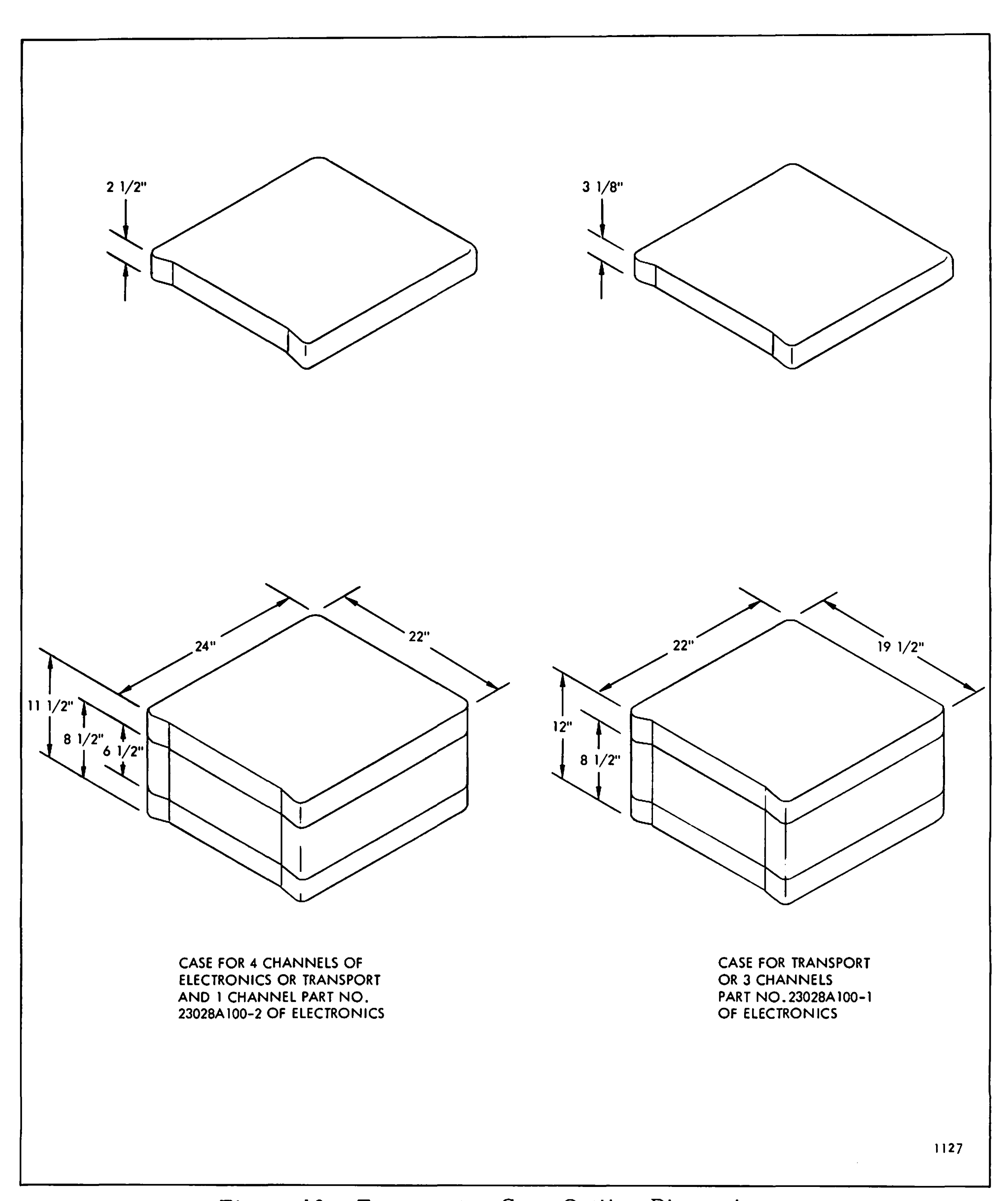



Figure 13. Transporter Case Outline Dimensions

#### Head Cables

If the tape transport is shipped with magnetic heads already installed, the head cables connector will probably be installed on the transport. If it is not, the end of the head cable with the single connector and bracket must be installed in its proper position on the transport. The head connector is located in a recess to the left of the capstan as viewed from above. Orient the cable connector properly and install it by securing it with two No. 4 screws, washers, and lock washer. By attaching this cable to the transport, the head assembly can be removed and installed from above without disturbing the head cable connector.

For tapes recorded on one recorder to be compatible with tapes recorded on other recorders, the head cables must be connected to the electronics assembly as shown in table 3. Head cables marked with a P are from the play heads, and must be connected to the REPRODUCE HEAD connectors for the channels indicated. Head cables marked with an R are from the record heads and must be connected to the RECORD HEAD connectors for the channel indicated. Cables marked with an E are from the erase head and must be connected to the ERASE HEAD connectors for the channels indicated.

#### Signal Connectors

Connect the input and output connectors for each channel to the SIGNAL IN and SIGNAL OUT connectors. These are standard 3-wire XL type connectors. Interface information is given under that heading in this section.

#### Remote Meters

If remote meters have been ordered, plug them into the REMOTE METER connector. Refer to the interface information for the remote meters under that heading in this section.

#### Pilot Tone

If a pilot tone is to be used, make this connection to the PILOT connector. Refer to the interface information for the pilot tone under that heading in this section.

#### Remote Control

If a remote control unit is to be used, connect the connector from the remote control to the REMOTE connector on the tape transport.

#### Edit Foot Control

If an edit foot control is used, connect it to the SPILL CONTROL connector on the tape transport. It is necessary to remove a jumper plug to make this connection. Do not misplace the jumper plug, since the machine will be inoperative without it if the edit foot control is later disconnected.

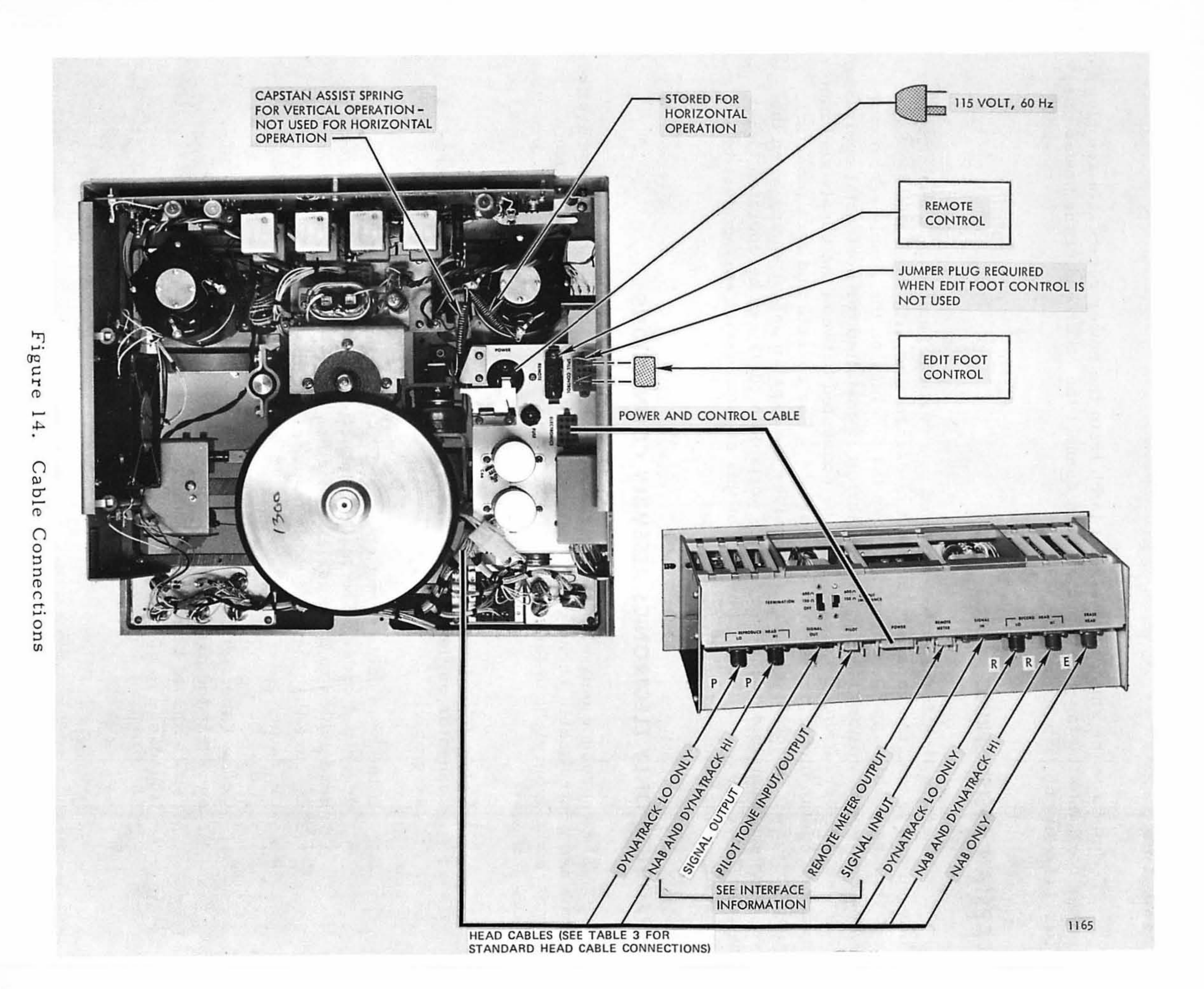



Figure 14. Cable Connections

### Power Cord

Pull back the shipping restraint latch from the power receptacle and plug the power cord into the tape transport. Then connect the other end of the power cord to a 115-volt 60 Hz power source.

## CAPSTAN ASSIST SPRING

When the tape transport is mounted in a vertical position, an assist spring is required to hold the capstan motor out of engagement with the flywheel when it is not running. This spring is stored across the two lugs on the supply reel motor when the tape transport is shipped, or when it is installed for horizontal operation. For vertical operation, this spring must be connected between the supply reel motor and the capstan motor bracket. See figure 14. For console and rack mounting installations, it is only necessary to consider the capstan assist spring when the equipment is installed. However, since portable models can be operated either vertically or horizontally, the position of this capstan assist spring must be considered each time the equipment is set up.

## REPRODUCE ONLY ELECTRONICS ASSEMBLY CONNECTIONS

The reproduce only electronic assembly requires three different connections: power and control cable, head cables, and signal output cables. The channel numbers run from right to left, looking at the rear connector panel. The connections are as follows:

1. Connect the power and control cable from the ELECTRONICS connector on the tape transport to the connector on the electronics assembly.

2. If the head cable is not connected to the transport, attach it as described under "Electrical Connections." Connect the channel head cables to head cable connectors on the electronics assembly. Be sure that the head cable numbers and the channel numbers are the same.

3. Connect the signal output cables to the XL type connectors. Be sure that the proper channel identification is maintained. The cables should be made up as shown in figure 16. The output impedance is 600 ohms.

Table 3. Standard Dynatrack and NAB Head and Signal Cable Connections

| FOR CHANNEL | USE ELECTRONICS ASSEMBLY NO. | REPRODUCE HEAD LO | REPRODUCE HEAD HI | SIGNAL OUT | PILOT | POWER | REMOTE METER | SIGNAL IN | RECORD HEAD LO | RECORD HEAD HI | ERASE HEAD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DYNATRACK ONLY SYSTEMS | | | | | | | | | | | |
| 1 | 1 | P2 | P1 | CH 1 OUT | | | | CH 1 IN | R2 | R1 | * |
| 2 | 2 | P4 | P3 | CH 2 OUT | | | | CH 2 IN | R4 | R3 | * |
| 3 | 3 | P6 | P5 | CH 3 OUT | | | | CH 3 IN | R6 | R5 | * |
| 4 | 4 | P8 | P7 | CH 4 OUT | | | | CH 4 IN | R8 | R7 | * |
| CHANGING NAB TO DYNATRACK | | | | | | | | | | | |
| 1 | 1 | P2 | P1 | CH 1 OUT | | | | CH 1 IN | R2 | R1 | * |
| 2 | 3 | P4 | P3 | CH 3 OUT | | | | CH 3 IN | R4 | R3 | * |
| 3 | 5 | P6 | P5 | CH 5 OUT | | | | CH 5 IN | R6 | R5 | * |
| 4 | 7 | P8 | P7 | CH 7 OUT | | | | CH 7 IN | R8 | R7 | * |
| NAB SYSTEMS | | | | | | | | | | | |
| 1 | 1 | | P1 | CH 1 OUT | | | | CH 1 IN | | R1 | E1 |
| 2 | 2 | | P2 | CH 2 OUT | | | | CH 2 IN | | R2 | E2 |
| 3 | 3 | | P3 | CH 3 OUT | | | | CH 3 IN | | R3 | E3 |
| 4 | 4 | | P4 | CH 4 OUT | | | | CH 4 IN | | R4 | E4 |
| 4 | 5 | | P5 | CH 5 OUT | | | | CH 5 IN | | R5 | E5 |
| 6 | 6 | | P6 | CH 6 OUT | | | | CH 6 IN | | R6 | E6 |
| 7 | 7 | | P7 | CH 7 OUT | | | | CH 7 IN | | R7 | E7 |
| 8 | 8 | | P8 | CH 8 OUT | | | | CH 8 IN | | R8 | E8 |

*Simultaneous erase and record is not provided for Dynatrack. New or bulk erased tape should be used for Dynatrack recording.

## INTERFACE INFORMATION

All input and output connections and circuitry of the Professional Audio Tape Recorder are based on standard operating procedures in the recording industry. Standard 3-wire XL type connectors are used for the signal inputs and outputs. Cables should be made up in conformance to standard practice as to length, shielding, etc., with connections as in the following paragraphs.

### Signal Input

To bridge a balanced studio line, connect the line to pins 2 and 3 of an XL male plug (figure 15) and insert it into the SIGNAL IN socket. Connect the ground to pin 1. Input level of -10 to +8 dbm based on the signal level in a 600-ohm line may be employed as a signal source. The load is approximately 20,000 ohms.

An unbalanced line source should be connected to pins 2 and 3 of the connector. Ground should be connected to pins 1 and 2. See figure 15. This provides a 20,000-ohm bridging input for signal levels as above. Pin 3 could be grounded rather than 2 without degradation of performance, but pin 2 is suggested as first choice in the interest of consistency.

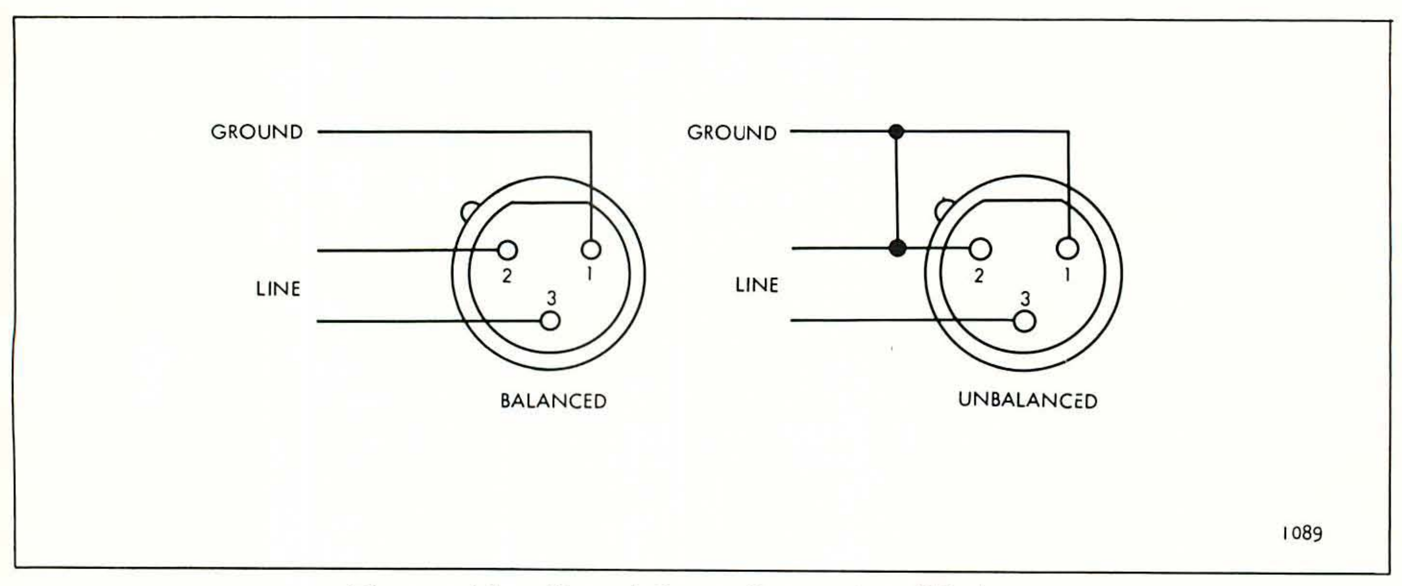



Figure 15. Signal Input Connector Wiring

### Signal Output

The output signal for connection to line facilities is to be fed from the male SIGNAL OUT connector to an XL type female connector on the outgoing cable. Use pins 2 and 3 for the signal output with pin 1 as ground. See figure 16.
A balanced line may be fed from 2 and 3, or an unbalanced line may be fed by grounding either 2 or 3. In the interest of consistency, it is suggested that 2 be employed as ground and 3 as the signal lead.

Two switches are provided on the rear panel of the electronics just above the SIGNAL OUT connector. The OUTPUT IMPEDANCE switch provides for selection of 150 or 600 ohms output line impedance and the TERMINATION switch provides for proper terminating impedances for either 150 or 600 ohms, if needed. If the outgoing line is properly terminated elsewhere, set this switch to the OFF position.

Note that the positions of these switches will affect the reading of the VU meter as much as 2 db. This meter is normally calibrated to read the proper levels in a +4 dbm 600-ohm line. It may be recalibrated by adjusting resistors in the line amplifier board. A chart of values for the selectable resistors is given under the discussion of this board in the Functional Description.

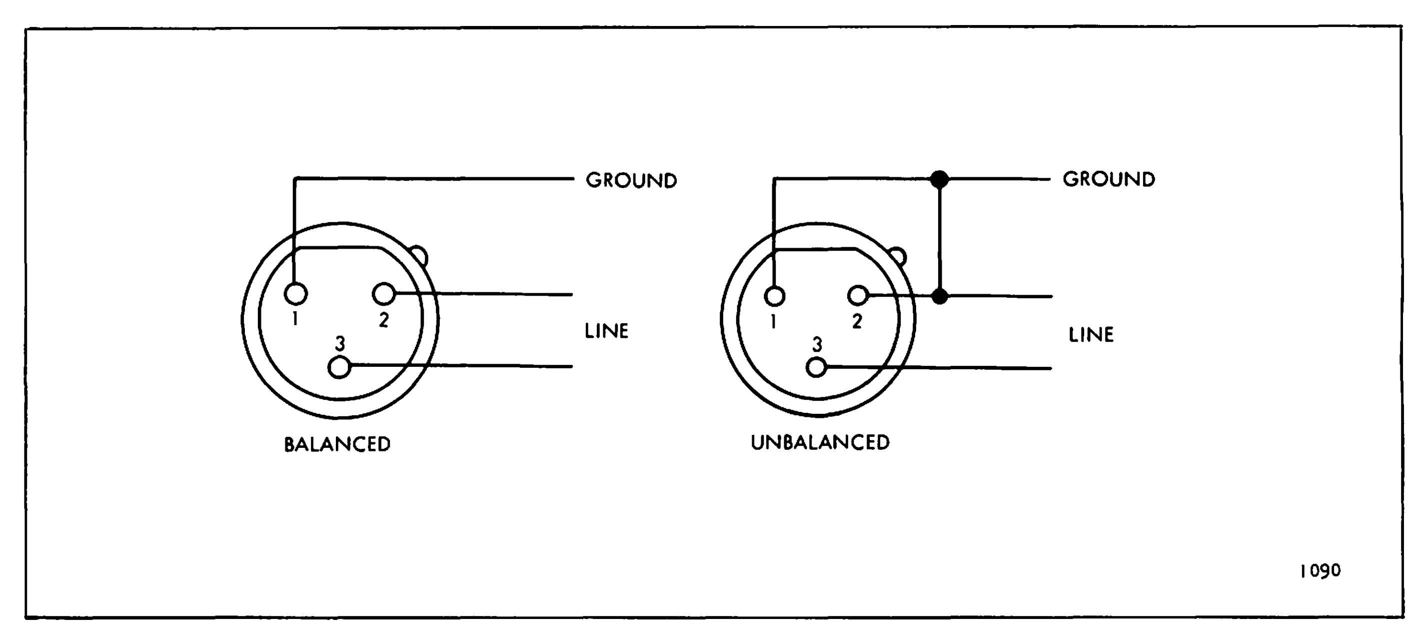



Figure 16. Signal Output Connector Wiring

**Remote Meter**

A remote VU meter may be connected to pins 1 and 4 of this connector. See figure 17. It is essential that it be "built out" with a resistor network identical to the one set up on the Line Amplifier Board for the local meter and as shown in figure 17. Select the values of R1 and R3 from table 10 for the proper line operating level.

The remote meter will indicate the same signals, input or output, as the local VU. It will not give indications of bias and erase current. Power to illuminate lamps in the remote meter is available on pins 3 and 6. Maximum drain should be 150 ma at 28 volts. A resistor is provided for in the Meter and Power Supply Assembly (R10) which may be selected to provide different degrees of lamp brightness.

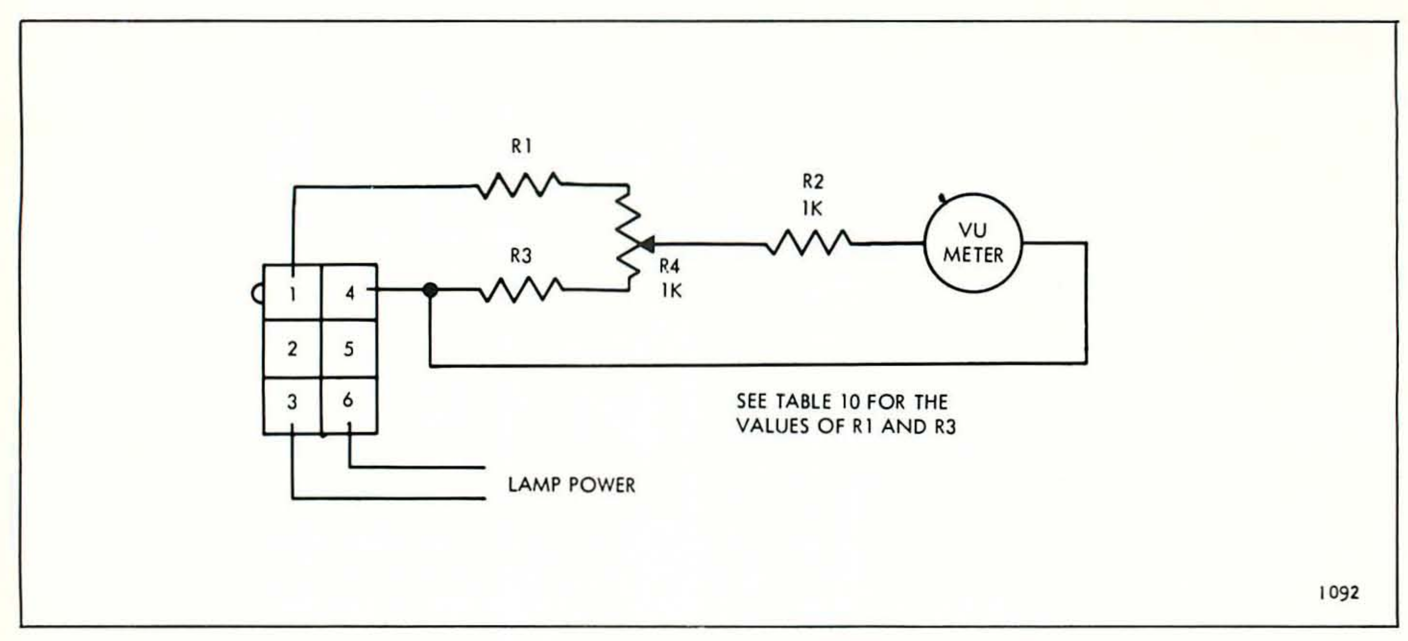



Figure 17. Remote Meter Connector Wiring

#### Pilot and Loudspeaker

This connector is provided to permit insertion of a reference tone, subsonic or supersonic, onto the track being recorded and to permit extraction of the tone on playback without having the level of either the recorded or reproduced pilot affected by adjustment of the front panel record or playback gain controls. The pilot tone to be recorded is applied at pin 1 with grounded return on 4. The reproduced pilot is on 2 with grounded return on 5. See figure 18.

This connector is also used to provide signal to an external monitor loudspeaker if desired. The speaker is to be connected to pins 3 and 6, and will operate at reasonable monitoring volume level when the VU is set up for +4 dbm lines. It will be 4 db louder when the VU is set for +8 dbm lines and so on. A simple attenuator may be installed on the speaker to reduce its volume.

#### Phones

Monitor earphones may be plugged into the PHONES jack on the front panel. High impedance phones are to be used. Neither side of the circuit is to be grounded. The phones will monitor either the input or tape playback, the same as the VU meter, which is the signal being fed to the output line.




A ground on either earphone lead will upset the characteristics of the line amplifier so that it will feed improper level to the meter and line and may go into oscillation.

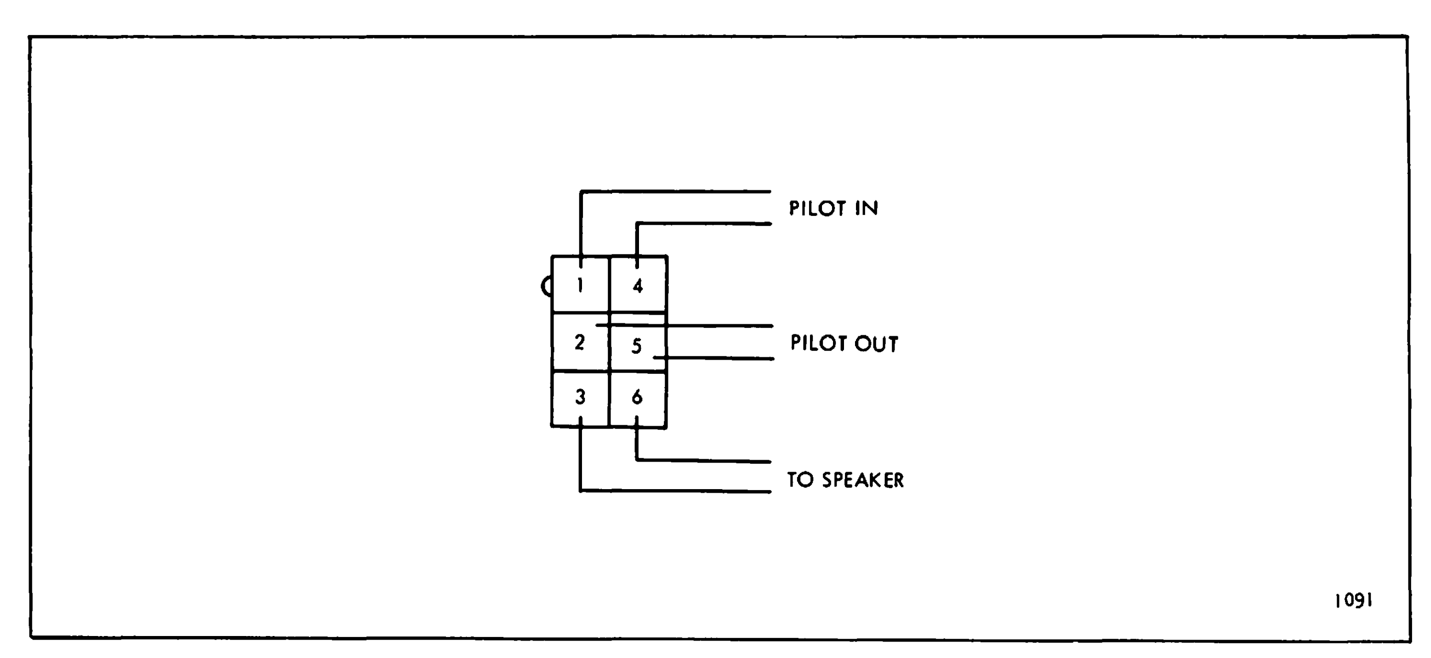



Figure 18. Pilot Connector Wiring

## Auxiliary Ground

A ground terminal is furnished on the transport frame. It may sometimes be desirable to connect this to a good ground to minimize electrical noise, although this is generally unnecessary if the power cord ground is sufficiently noisefree.

# OPERATING CONTROLS AND DETAILS

In this section are considered all controls which are directly accessible from the top surface of the transport and from the front surface of the electronic assemblies. Internal adjustments to be made with screwdriver or wrench are discussed in the Alignment and Adjustment section.

## TAPE TRANSPORT CONTROLS

The normal operating controls are located in the lower right-hand corner of the transport. See figure 7. These five illuminated pushbuttons control all tape movement through a system of safety interlock relays that prevent malfunction because of improper operation. Any button can be pushed in any sequence, at any time, with complete safety to the tape and machine.

### PLAY Button

This causes the transport to move the tape at normal forward or record speed under capstan speed control. The transport can be placed in PLAY at any time from any tape mode. For recording, both the PLAY and RECORD buttons must be pushed simultaneously when tape is either at standstill or in the normal forward, play mode.

### FORWARD Button

Activates the high speed tape advance in the forward direction. The fast forward mode may be initiated without pressing the STOP button. In fast forward, the tape lifters are activated and the head shield opens. The tape lifters may be manually overriden to allow tape to be heard. When the STOP button is operated from this mode, dynamic braking is used to stop tape, then a slight holding torque is applied to maintain tape tension.

NOTE

Magnetically operated reed switches, operated from a direction sensitive vane under the takeup reel turntable, control the dynamic braking and electrical switching when the transport is taken out of FORWARD or REWIND mode. This vane is a sensor to determine the direction the tape is traveling. The appropriate reed switch then activates relay control circuits which place the transport in either FAST, FORWARD, or REWIND, preliminary to the STOP mode, depending upon the original direction.

### STOP Button

This button stops all tape motion from any mode of operation. It also indicates when the transport is ready for operation. It is illuminated when the transport power is on and tape is threaded in the tape path. Without tape in the tape path, the unit will not operate and this button will not be lit. When the STOP button is activated while tape is in the high speed mode, dynamic braking is applied until the tape stops. Then, the transport goes into the STOP mode and a light holding torque is applied by both motors to maintain tape tension.

### REWIND Button

Tape may be put into high speed rewind from any other mode of operation, even from fast forward, without danger of tape breakage. Tape lifters on both heads operate during high speed rewind and the headshield opens. The tape lifters may be manually overridden if you want to hear the tape.

### RECORD Button

This button connects the recording circuits to the record head. To operate, the button must be pushed at the same time as the PLAY button is pushed. This must be done when tape is either at standstill or running in PLAY mode. Stopping the tape, or changing the tape mode of operation, automatically deactivates the recording circuits; and the RECORD and PLAY buttons must be pushed again to resume recording. To complete the recording circuit, the recording amplifier switch on the applicable electronic assemblies must be in RDY position.

The remaining controls are mounted in the lower left-hand of the transport.

### POWER Switch

AC power to the entire recorder is controlled by this switch.

NOTE

The tape transport will not be energized and the STOP button will not light until tape is threaded into the tape path.




Do not turn the power off when the transport is in a fast tape travel mode (REWIND or FORWARD). This could throw a tape loop because the dynamic braking will not operate.

## A-B OUTPUT Transfer Switch

This pair of pushbuttons provides for simultaneous transfer of the signal outputs of each electronics assembly from the input line to tape playback, or vice versa. The A button sets all channels to monitor the input signal. The B button transfers monitoring of all channels to the output signal.

## RUNOUT Switch

NOTE

Apparatus associated with this switch is not normally furnished. It must be specially ordered.

This switch controls the actions of a photo sensor in the tape path. It can be set to automatically stop the tape, or to automatically rewind the tape. The switch circuits will also automatically start another tape machine. To activate the circuits, punch a 1/4 inch hole in the tape, or remove the oxide with solvent 3/8 inch above the lower edge of the tape at the point where one of the automatic operations is desired. When the hole passes the sensor, the tape will automatically stop, or rewind, depending upon the position of the switch. When the switch is in the center (NORMAL position), the automatic feature is inactive. When no hole is made in the tape, the unit will automatically shut off when the tape runs out.

## SPEED Switch

The SPEED switch selects either of the two speeds at which the machine operates. These are normally 7 1/2 and 15 ips; however, other speed pairs are available.




This switch should not be operated with the capstan motor running. Power must be off or tape not threaded.

## BALANCE Switch

This 3-position switch changes motor torque factors to compensate for reels of different weight and/or size. When both reels are identical, the switch remains in the middle, or BALANCED position. If the left reel is larger or heavier, the switch should be in the left position. If the right reel is larger or heavier, place the switch in the right position.

## TAPE TRANSPORT, TAPE HANDLING COMPONENTS

The following tape components are in the capstan handling assembly area. See figure 19.

### Reversing Idler

Tape is threaded around this free-wheeling idler, which helps provide an extremely short path of unsupported tape. Ridges in the idler provide for air passage during high-speed tape movement, so that the tape hugs the idler.

### Editing Index

The tri-colored bars and dots on top of the reversing idler are used for precision editing, as described in the section on editing.

### Head Assembly

All head stacks, erase, record and play, are mounted on a single plug-in precision plate which is mounted on the transport casting beneath this head cover. The trim plates must be removed in order to remove the head assembly.

Azimuth of record and playback heads may be adjusted by removing the head cover plate located between the capstan and reversing idler.

### Tape Lifters

The tape lifters automatically move tape away from heads during high-speed tape travel to reduce head wear and cut chatter. They are electrically interlocked with the playback head shield door so that the latter opens to make room for the tape when lifters move it away from heads.

The tape lifter may be manually overridden by pressing the tape lifter and override lever. This restores the tape against the head so that it may be heard.

### Head Shield Door

The head shield door provides for hum reduction and automatically drops away from head during high-speed tape travel and whenever tape is lifted from tape path. This allows easy removal of tape for editing, etc.

### Capstan

The differential capstan is the basis of the patented Isoloop system for transporting tape with extremely low flutter and wow. Its function and operation is described in the General Description Section.

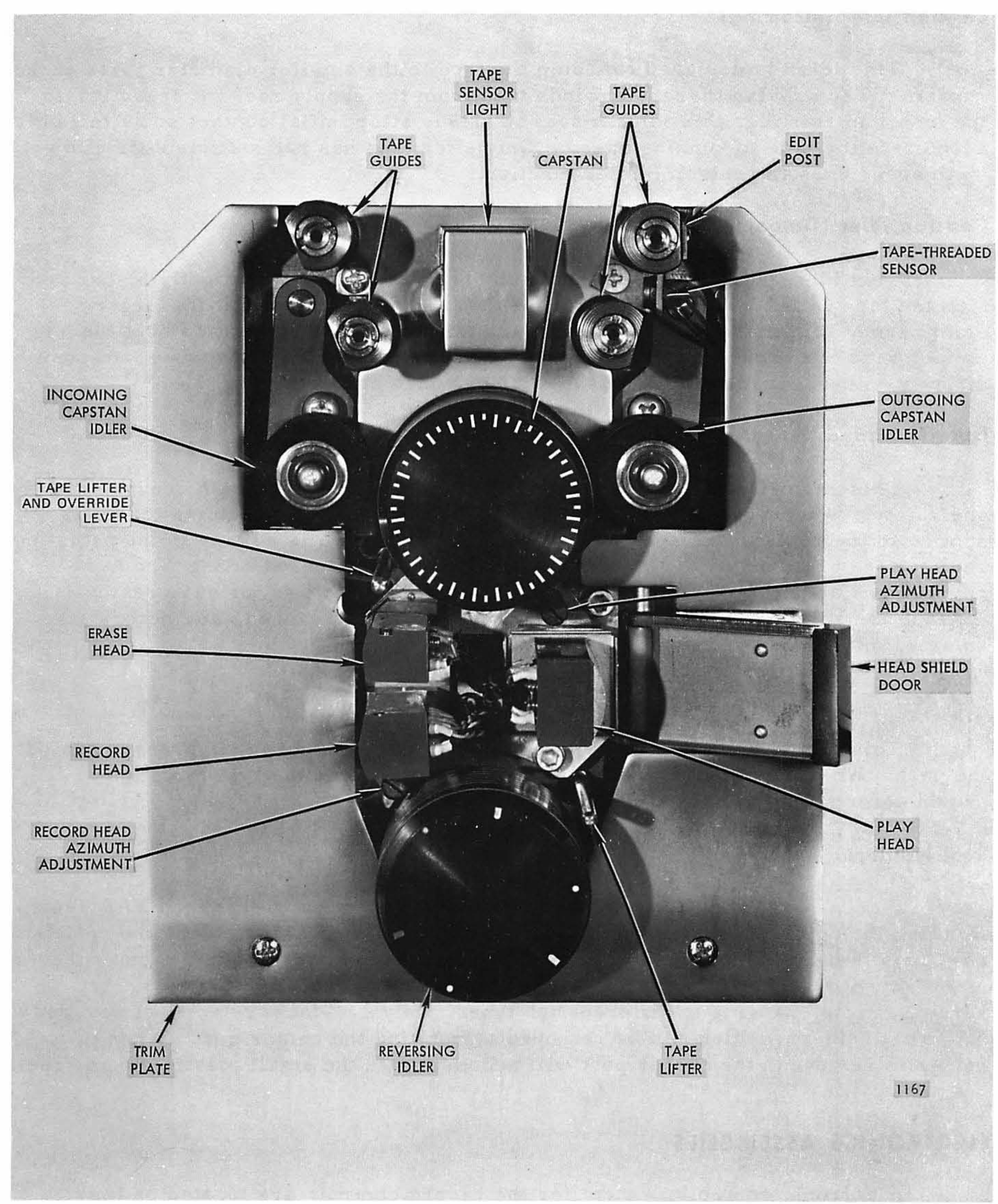



Figure 19. Tape Drive Components

### Capstan Idler (Incoming)

This idler is designed to clamp the tape to the smaller diameter parts of the capstan. The capstan thereby unwinds tape from the supply reel and feeds it into the loop. In starting, this idler moves in slowly after initial contact so as to gently accelerate the tape to running speed. Only after tape has had sufficient time to get up to speed does the outgoing idler function.

### Capstan Idler (Outgoing)

This idler pulls the tape through the head assembly at a slightly higher rate than the tape is fed in because it presses the tape to the capstan at its larger diameters. This maintains a constant tape tension across both heads, but the tension does not exceed the stretch capabilities of the tape. It is moved into position directly without retardation of dashpot as provided on the ingoing idler.

### Tape-Threaded Sensor

This photoelectric circuit across the tape path provides both convenience and safety. Whenever the tape breaks the light beam, a slight holding torque is applied to the reels to maintain tape tension. When there is no tape in the path, the reel motors are deenergized, the tape turntables are free-wheeling, the head cover opens, and all pushbuttons are deactivated. This allows for easy removal of the tape for splicing. Also, when the end of the tape is reached, the motors stop quickly, minimizing tape whip-around.

### Edit Post

This is a sharp edge that puts a crimp in the tape when it is pressed against the post. When used in conjunction with the editing aid on the reversing idler, it provides for easy, trouble-free editing.

### Reel Holders

Standard reel holders are supplied for holding down 10-1/2 inch NAB reels. Rotating the upper portion of the holder, when a reel is in place, locks the reel on. This is useful when the machine is mounted vertically. Locking is not necessary when transport is horizontal or at a slight angle. Removal of the large center screw permits changing to different hub types. Only 1/4-inch systems are supplied with NAB reel holders, which can be removed by rotating the center post. When the NAB holder is removed, the center post will accommodate the small plastic cinema reels.

## ELECTRONICS ASSEMBLIES

Electronic controls, except for the record control, are located on the electronics assembly for each channel. These controls are shown in figure 20 and their description follows.

## RECORD LEVEL Control

This adjusts the signal level recorded on the tape. It may be adjusted through a line input level range of -20 dbm to +8 dbm (600 ohm line). To monitor the signal audibly, or to read the level of the incoming line, the METER switch is set to SIGNAL and the OUTPUT SELECT set to A. After the level is properly adjusted, the knob may be locked by turning the ring behind it in a clockwise direction.

## REPRO. LEVEL Control

This adjusts the playback gain. It is a locking control. It is not necessary to calibrate a level setting for this control by employing a standard tape and then locking the control in place. This is because the METER switch has a calibrate (CAL.) position which substitutes a fixed pad for the REPRO LEVEL variable gain control whenever it is desired to calibrate levels. The REPRO LEVEL control is only in the normal tape playback path. The OUTPUT SELECT button B must be pressed to transfer the meter and output line to the playback circuit.

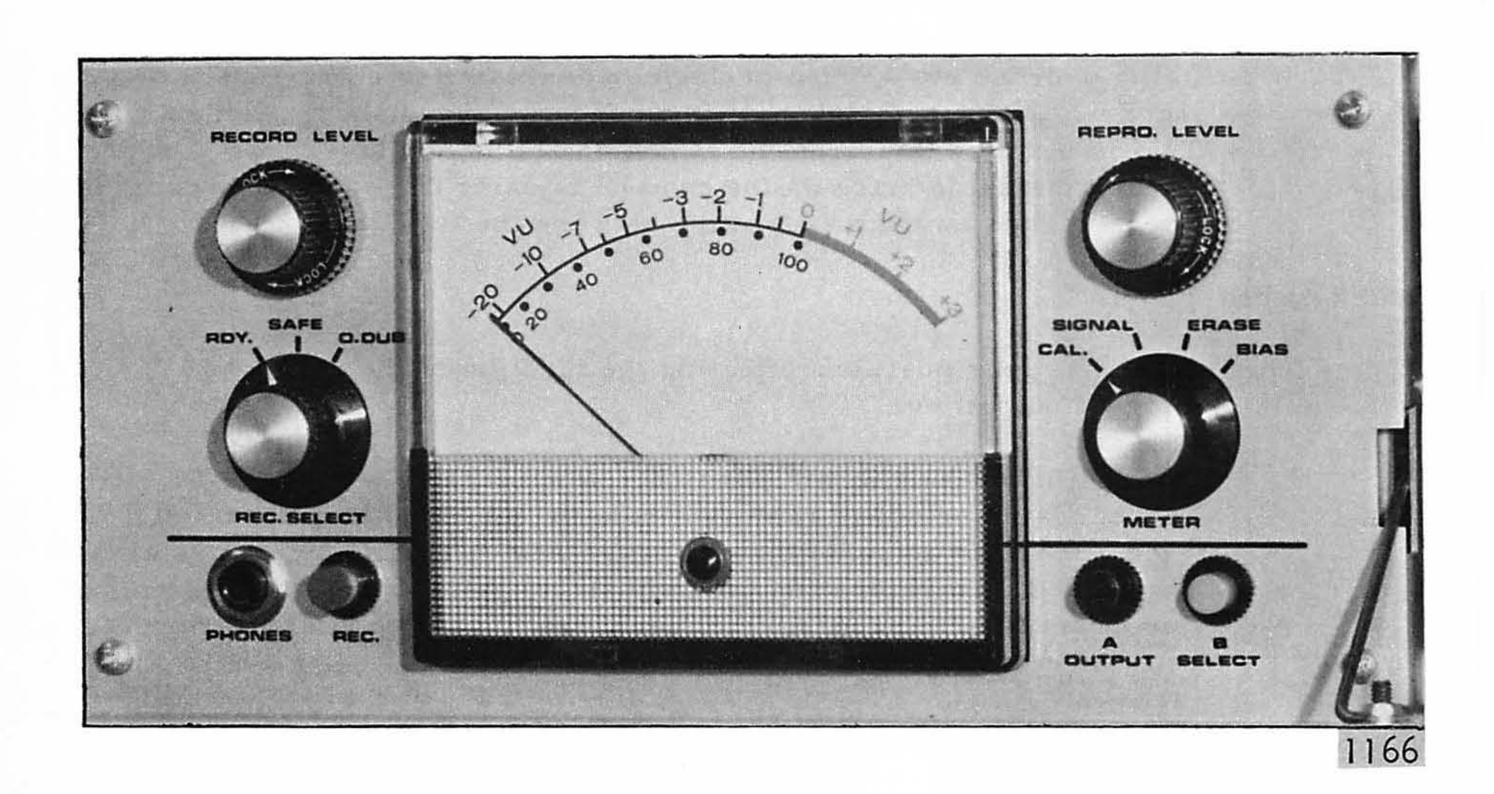



Figure 20. Electronic Controls

### REC. SELECT Switch

This has three positions affecting only the record circuits.

1. RDY. In this position, the circuits for the particular channel are ready to record. If the RECORD and the PLAY buttons on the transport or its remote control unit are pressed simultaneously, the record circuits will be activated and the red REC lamp will light. In an NAB configuration, the eraser and the record head for this track will be activated. In the Dynatrack configuration, no eraser is activated, but both tracks of a single channel will be energized.

2. SAFE. In this position, the erase and record circuits will be locked off so that accidental erasure or damage to a previously recorded tape will not occur should the record mode be selected at the transport or remote control.

3. O. DUB. This is the overdub position. This prevents the record and erase circuits from being energized and substitutes the record head in place of the normal playback head for this track in the NAB configuration. In the Dynatrack setup, it substitutes the HI record head in place of the normal HI playback head. The LO track remains unaffected. In the overdub position, a performer can listen to a previously recorded track while adding a new part in perfect synchronism on another track. This is because the signal he is hearing is being played from a record head in the same stack as the head he is using to add the new recording. There is thus no time separation between the two.

### METER Switch

This switch has four positions affecting the function of the meter and influencing the signal output level.

1. CAL. This is a calibrate position. When it is selected, the REPRO LEVEL gain control is removed from the playback amplifier and a fixed attenuator is substituted. Thus, a known overall gain can always be checked as a reference. An adjustable gain control in the preamplifier is set to give proper meter level readings from a standard reference tape.

   The switch may then be set to the SIGNAL position where the variable REPRO LEVEL control permits operating playback gain adjustments, as necessary.

2. SIGNAL. In this position, the meter monitors either the input signal, A, or the playback signal, B, depending on which OUTPUT SELECT indicator is lit, A or B. Similarly, the signal fed to the outgoing line (SIGNAL OUT) is either A or B.

3. ERASE. In this position, the meter shows a steady deflection, depending upon the magnitude of the high frequency current in the erase head when in the standard NAB configuration. In the Dynatrack configuration, the meter reads the magnitude of high frequency bias current in the LO track. The output signal to the line remains under the control of the A-B OUTPUT SELECT switches the same as described above under SIGNAL.

4. BIAS. In this position, the meter reads the magnitude of high frequency bias current in the regular NAB record head or the HI track record head in the Dynatrack system.

### OUTPUT SELECT Switches

These consist of the illuminated A-B buttons mentioned above. Whenever the METER switch is in any position other than CAL, these buttons determine the source of signal to be fed to the outgoing line (SIGNAL OUT connector). When the A button is pressed and the A lamp lights, the input signal is being monitored and is the signal output. When the B button is pressed and the B lamp lights, the outgoing signal is then connected to the playback circuits to monitor the signal reproduced from tape. The A-B transfer buttons on the transport can switch all channels at the same time, but individual channels remain under control of their A-B buttons.

A small slide switch on the Line Amplifier circuit board will inactivate the automatic A-B transfer, if desired. When inactive, the transfer is solely under control of the A-B buttons on the particular electronics assembly.

### REC. Indicator

This is a recording indicator lamp to show when the record and erase circuits are energized. It is under control of the RECORD button on the transport but may be locked out of service by placing the REC. SELECT switch in either the SAFE or 0. DUB position rather than its normal RDY. position.

### PHONES Jack

This jack is provided to drive a high impedance earphone, which bridges across the output signal line. Since this is usually operated as a balanced circuit, neither side of these phone may be grounded.

This description of the controls on the electronics module covers all controls and indicators normally referred to in the course of operating the recorder. The front cover door hinges down to reveal a series of plug-in electronic boards which contain a number of screwdriver adjustable components. These are normally not adjusted by operating personnel. Maintenance personnel employ them to trim a machine into peak performance. They are referred to under Alignment and Adjustment, Routine Maintenance, and Circuit Descriptions.

# GENERAL OPERATING PROCEDURES

## PRELIMINARY

Slide the plate (see figure 7) covering the slide switches to the left so that it covers the POWER switch and reveals the three slide switches. Set the SPEED switch to either HIGH or LOW as desired. Set the RUNOUT switch to its mid-position, NORMAL. Identical large reels should be used on both reel spindles. If this is done, set the BALANCE switch to its mid-position. Slide the switch cover to the right, revealing the POWER switch and A-B OUTPUT buttons.

## THREADING

Threading the recorder is extremely simple, as there are no compliance arms or other mechanical devices in the tape path. See figure 21. Also, there is no tension on the tape until it breaks the photoelectric circuit in the Isoloop assembly, so the reels are free-wheeling, To thread, first push the POWER button to turn the machine on. Place a roll of tape on the left hand spindle in such a manner that the reel rotates counterclockwise when tape is unwound. Take the tape from the supply reel, drop it between the capstan and the incoming idler, past the record head, around the reversing idler, past the play head (the head shield is open), between the capstan and outgoing idler, then onto the takeup reel. Thread the tape onto the reel hub so that it will wind in a counterclockwise direction. As the tape breaks the photoelectric light path after the outgoing idler, a slight holding torque is applied which takes up any slack in the tape. The transport is now ready to operate.

Observe that the control buttons function in the manner intended and that they are each illuminated in their operating mode. Observe that the playback head cover door closes when the machine is started in the play or record mode and that it opens when the tape lifters raise tape off the heads in fast forward or rewind modes. Observe that in standby with tape threaded in place, the head cover door will remain either open or closed when operated manually. Observe that this door, if closed in standby, will open if tape is lifted from its running path at the right hand guiding system prior to reaching the takeup reel.

## MONITORING

All electronics assembly adjustments described in the following paragraphs are for a single recording channel. In multichannel machines, perform the procedure for each channel of electronics.

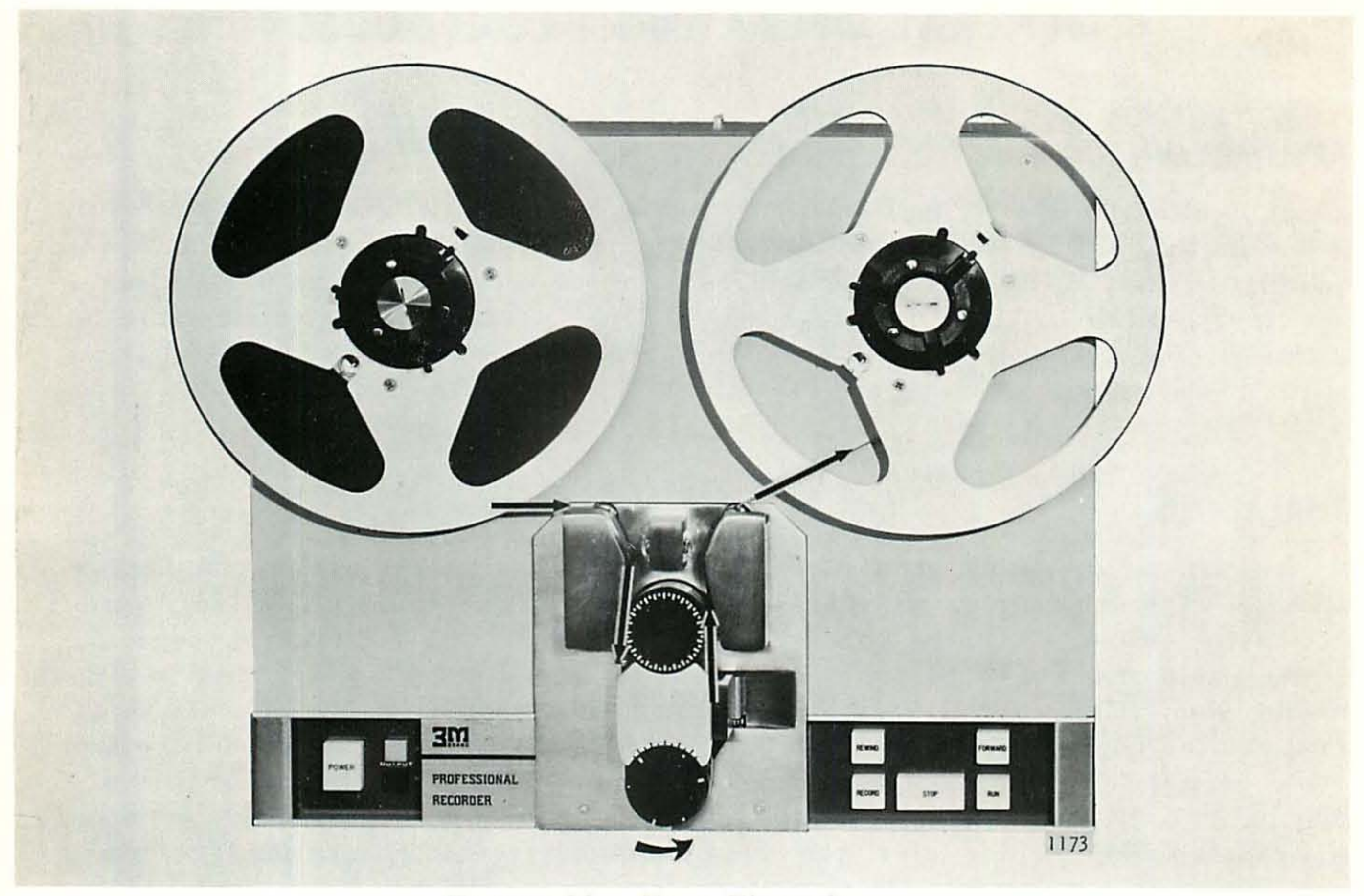



Figure 21. Tape Threading

Signals to be recorded and reproduced can be monitored by: (1) the VU meter on the electronics assembly, (2) an earphone (high impedance, ungrounded) plugged into the PHONES jack, (3) a loudspeaker connected directly to the PILOT connector at the rear of the electronics assembly (terminals 3 and 6), or (4) from the signal output connector on the rear panel.

To monitor the recorder input signal, set the METER switch to SIGNAL and press OUTPUT SELECT button A. The signal amplitude will be under control of the RECORD LEVEL knob.

To monitor signals reproduced from recorded tape press the OUTPUT SELECT button B. The REC. SELECT switch should be in either RDY or SAFE positions. With the METER switch in the SIGNAL position, the REPRO. LEVEL knob will determine the loudness of the monitored signal.

To determine the true magnitude of signal level on the tape, place the METER switch in the CAL. position. The loudness and meter reading are then determined by a fixed calibrated amplifier gain rather than the variable REPRO. LEVEL control. The A-B OUTPUT transfer buttons on the tape transport can switch all channels of a multichannel system at the same time.

## RECORDING

Set the RECORD LEVEL knob and the REPRO LEVEL knob to minimum (fully counterclockwise).

Set the REC. SELECT switch in the RDY. position. In Dynatrack systems, previously degaussed or new tape must be used. In NAB systems with erase heads, new, degaussed, or previously recorded tape may be used.

Set the METER switch to the SIGNAL position.

Press OUTPUT SELECT button A.

Slowly increase the RECORD LEVEL control until the meter peaks at +2 VU on the loudest peaks on input program material. The signal should be clearly heard in the monitor system. Have the program source cut off by fade or switching. Listen for acceptability of residual noise, particularly low frequency hum. For truly critical applications, for which this machine is designed, a vacuum tube voltmeter should be used to determine residual circuit noise. Recorder-contributed noise in this test will generally be well below external circuit noise. Have the program feed restored at the former level.

To start recording, simultaneously press the PLAY and RECORD buttons on the tape transport. These two buttons should light and the red REC. indicator on the electronics panel should also light.

Press OUTPUT SELECT button B. Slowly increase the REPRO. LEVEL control until the signal is audibly and visually the same loudness as the input signal. This can be easily determined by alternately pressing the A and B buttons. Listen critically on a good monitor speaker system to be certain the signals sound identical in either the A or B position after their levels are set as closely the same as possible.

Cut off the input signal and listen for noise. No increase in hum should be observed in the B position when compared to the A position. In NAB systems, tape noise should be the only additional source of noise observable in playback. In Dynatrack systems, even this should be extremely difficult to observe. Noise measurements are outlined under Alignment and Adjustment.

Press the STOP button. The tape should stop. The REC. indicator should go out.

If A-B transfer from the transport is not wanted, open the front panel cover of the electronics assembly, and position the upper slide switch on the line amplifier board in slot 6 to the OFF position. A-B switching is then solely under control of the A-B buttons on the electronics panel.

## PLAYBACK

Playback is accomplished simply by pressing the PLAY button on the tape transport. The B output must be selected.

When the recorder is used for reproducing a previously recorded tape, it is wise to set the REC. SELECT switch in the SAFE position. Should the RECORD and PLAY buttons be pressed simultaneously in error, the recording circuits will still be locked out and the tape protected against accidental erasure.

## OVERDUBBING

When ordered, the overdub feature is provided on the playback preamplifier boards. It is controlled by the REC. SELECT switch.

It provides a means of adding a second audio track in synchronism with a first track (or first set of tracks, depending on the number of channels built into the machine).

Consider a two-track NAB machine as an example. We will call the channel numbers 1 and 2. An orchestra is recorded on track number 1 and it is desired to add a synchronized vocal in track number 2 which has been left unrecorded. If track number 1 is played into earphones for the singer's benefit in the normal way from the regular playback head, the singer's voice will be recorded on track 2 displaced on the tape from the orchestra recording by the linear distance from the playback head stack back to the record head stack. The two can therefore never be played in synchronism because of the scanning time differences which arise.

Therefore, it is necessary to play the orchestra track (No. 1) from the No. 1 record head, substituting it for the No. 1 playback head. The overdub preamplifier provides proper gain and equalization to accomplish this when the REC. SELECT switch is set to the O. DUB position. Furthermore, this position of the switch locks off its recording electronics as in the SAFE position so that the orchestra track may not be destroyed. The singer's track, No. 2 is left in the RDY. position and the recorder is started in the RECORD mode. The singer then sings in synchronism with the orchestra and both tracks No. 1 and No. 2 are vertically oriented so that there is no time displacement between them. When the singer has finished recording his part, both tracks may be played back through the regular playback head assembly by placing both No. 1 and No. 2 REC. SELECT switches to SAFE.

## ERASURE

Erasure is automatic on NAB configurations, since the electronics module is constructed to feed two high-frequency circuits. One of these is the record head bias requirement and the other is the eraser. In the Dynatrack system, the

erase power source becomes the bias source for the second track required by this two track system. To take full advantage of the increased dynamic range and lower noise level provided by the 3M recorder, all recording should be done with new tape, or tape that has been very carefully bulk erased.

## EDITING

Due to the basic simplicity of the Isoloop drive system, plus the advantages of dynamic braking, automatic tape tension and release, and the unique editing feature which is provided on the reversing idler, tape editing is extremely fast, accurate and easy.

To locate the cutting point, follow the normal procedure of "rocking" the reels to and fro by rotating the reel knobs. Because there is only a slight holding torque on the motors, this requires very light effort. Once the cutting point has been found, note the position of one of the colored edit dots on the top of the reversing idler in relation to one of the markings on the scale (figure 22-A). Now move the tape forward by hand approximately 2/3 of a turn of the reversing idler until an edit line of the same color as the dot is opposite the same scale marking (figure 22-B). Now,using your forefinger, press the tape against the sharp edge of the edit post (figure 22-C). This puts a light crimp in the tape, precisely marking the point of cutting. Lift the tape out of the tape path, deenergizing the reel motors and allowing the tape to be completely slack (figure 22-D). After making the splice, simply drop the tape back in the tape path. The holding torque is again applied automatically. You are now ready to advance tape to the next editing point.

This simple yet highly precise editing system eliminates completely the need for grease pencils and other makeshift marking devices which require the tape to be cleaned after editing.

NOTE

When extensive editing is to be done, the REC. SELECT switches on the electronics assemblies should be placed in SAFE position to eliminate any possibility of accidental erasure of the tape. because of inadvertent pressure of the RECORD button.

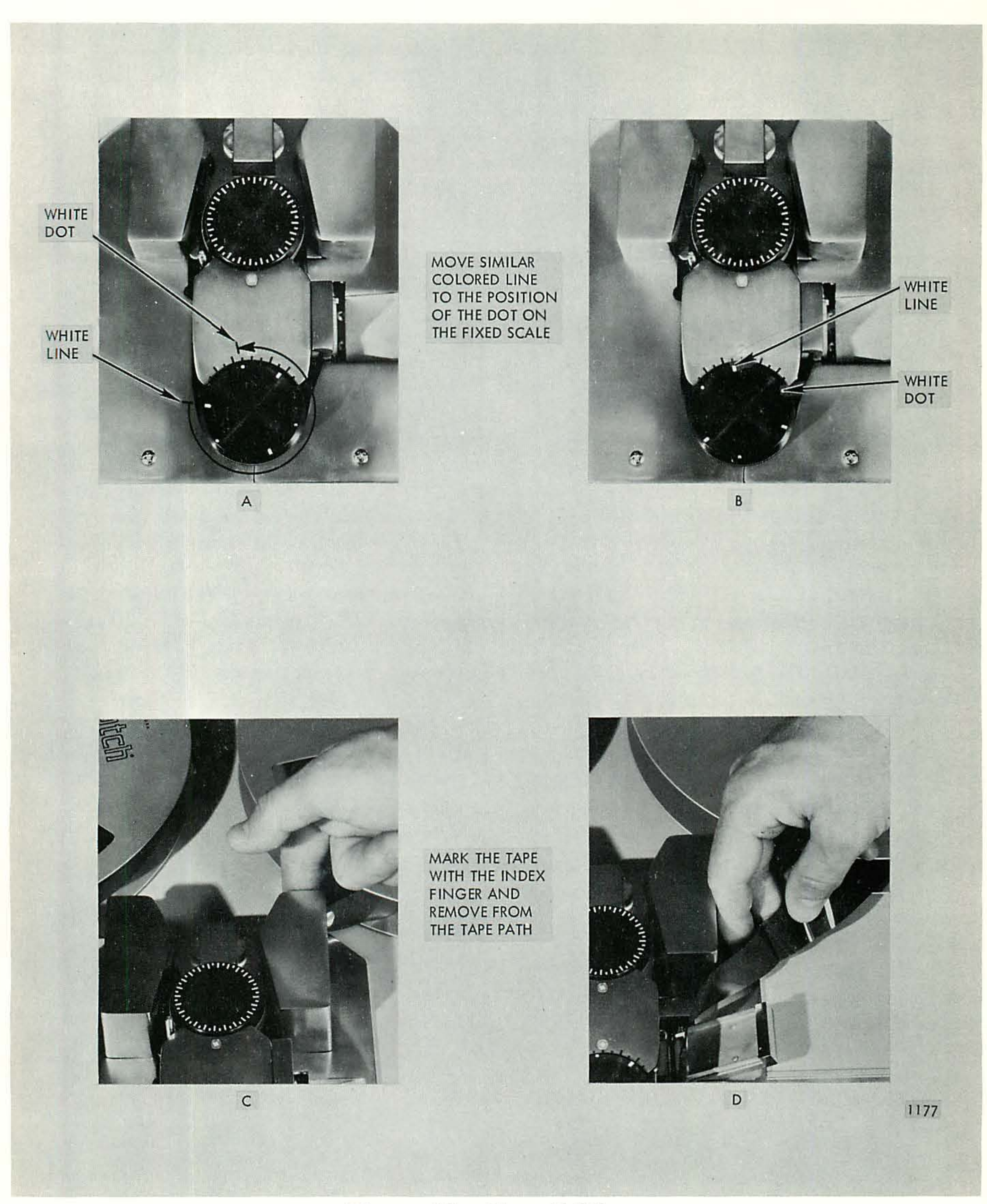



Figure 22. Tape Editing

# ALIGNMENT AND ADJUSTMENT

## TAPE TRANSPORT

The tape transport has been factory aligned for peak performance. With use it will occasionally be necessary to undertake routine inspection of the machine and check certain adjustments. The following information provides a procedure for thorough check of the tape transport. After the user has followed this procedure a few times, it may be found that certain steps may be checked at less frequent intervals. Location of transport adjustments is shown in figures 23 and 24.

1. Remove the six screws that hold the transport cover plate in place and remove the cover plate. The bottom of the cover is held in place by a lip. No reels are to be on machine.

2. Connect the input power cord to the output of a 7-1/2-amp Variac set to zero volts.

3. Increase the Variac output voltage; at approximately 90 volts, relay K1 should be heard to operate, the POWER button should light, and the tape sensor light should come on. If this does not happen, press the POWER button.

4. Continue to increase the Variac voltage until its dial indicates 115 volts. All five function control buttons should be dark and no motors, including the fan, should be operating. The illumination level of the POWER button should not change.

5. Place a piece of opaque material in the tape path between the tape sensor light and the tape-threaded sensor. This will be referred to hereafter as the "tape sensor mask." The STOP button should light. The takeup motor should rotate at approximately 55 to 80 rpm in a counterclockwise direction. The rewind motor should rotate slightly faster (approximately 60 to 85 rpm) in a clockwise direction. The capstan motor should move forward to engage the flywheel tire and it should start turning, driving the capstan in a counterclockwise direction. The fan should also start at this time.

6. Remove the tape sensor mask. The STOP button light should go out and all motors should stop. The capstan motor should move so that its shaft no longer contacts the tire on the flywheel.

7. Reinsert the tape sensor mask. Move the capstan motor SPEED switch to HI. Observe that it runs at high speed. Remove the tape sensor mask. Move the SPEED switch to LO. Reinsert the tape sensor mask. Observe that the capstan motor runs at half

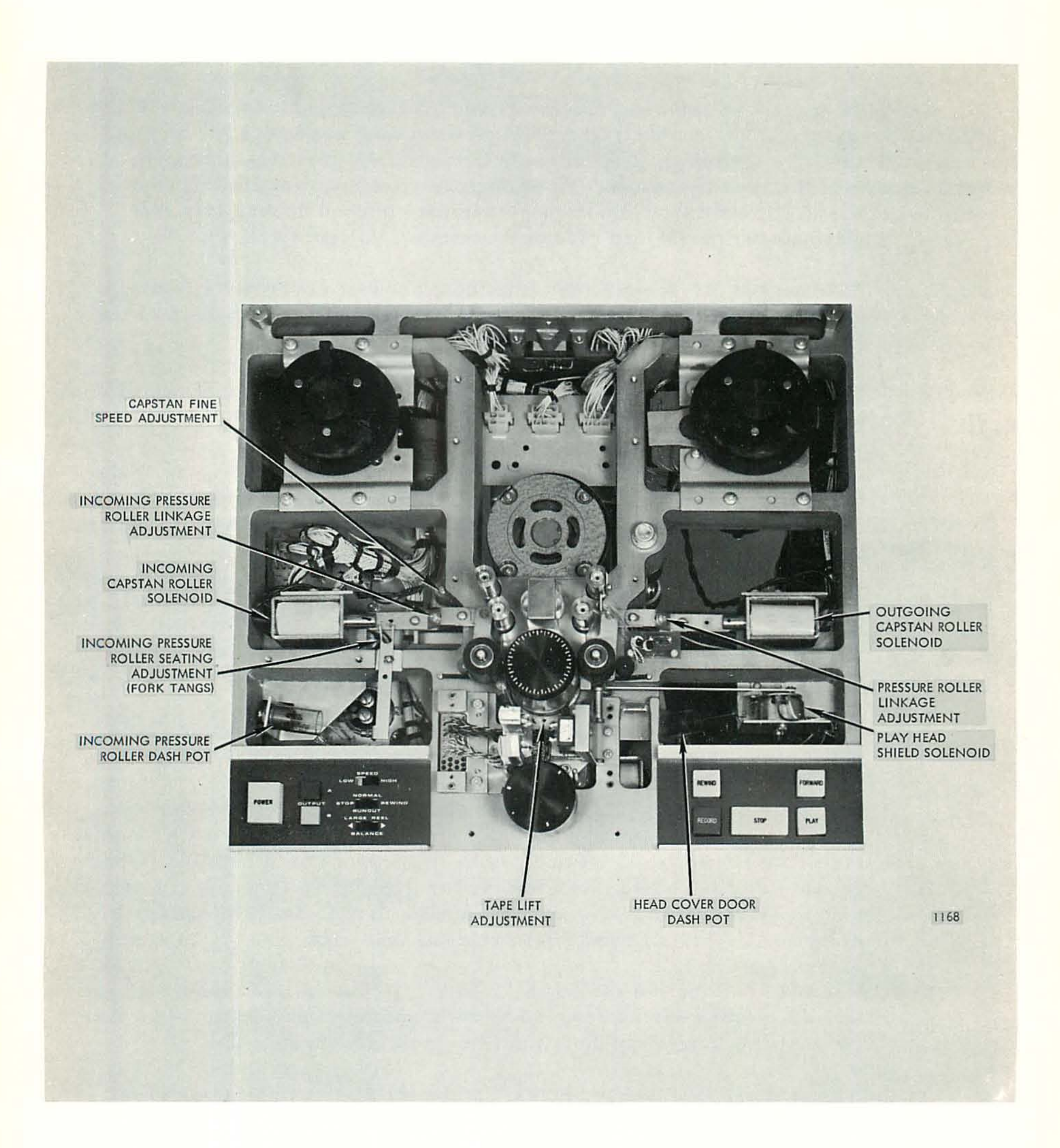



Figure 23. Tape Transport Adjustments, Top View

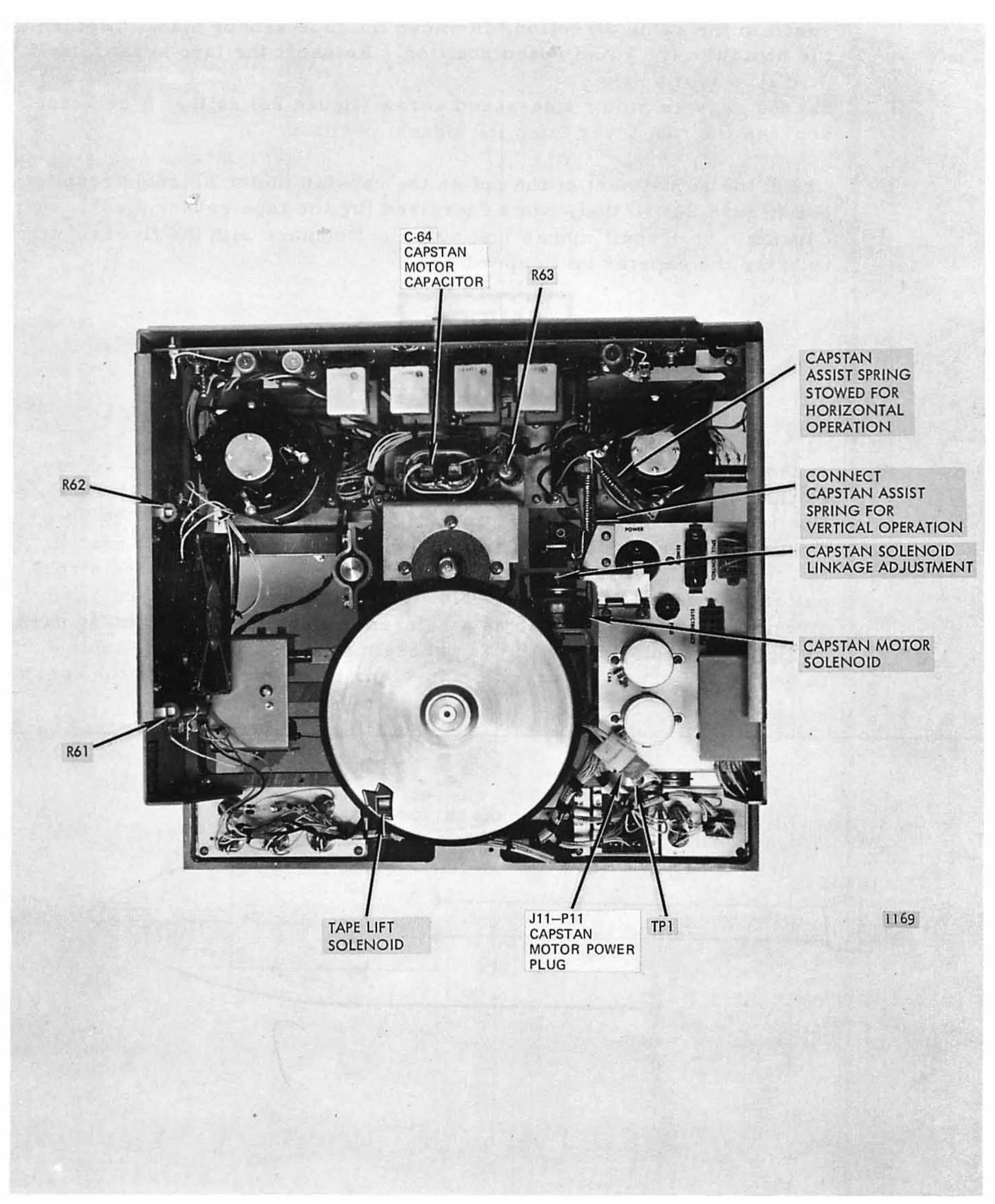



Figure 24. Tape Transport Adjustments, Bottom View

speed in the same direction. Remove the tape sensor mask. Return the switch to the HIGH speed position. Reinsert the tape sensor mask.

8. Set the capstan motor fine-speed screw (figure 23) so that it does not depress the foot lever from its highest position.

9. Check the adjustment of the nut on the capstan motor solenoid coupling rod (figure 24) so that, when energized (by the tape sensor mask), the capstan motor shaft makes just sufficient contact with the flywheel tire to bring the capstan up to speed.




Do not stall the flywheel while permitting the motor to run since the rubber may be quickly damaged at the point of contact.

10. A neon indicator operated half wave from the same frequency source as the capstan motor or a stroboscopic lamp triggered from the power line frequency should now be used to check the capstan speed by lighting the strobo disc. A simple but effective circuit is shown in figure 25. The capstan should appear to run slow; that is, the strobe pattern appears to rotate very slowly in a clockwise direction. Use an improvised wire pointer as a reference and observe how many dark or light elements appear to pass beneath it per minute. Use table 4 to determine speed error with a 48-element strobe wheel on the capstan.

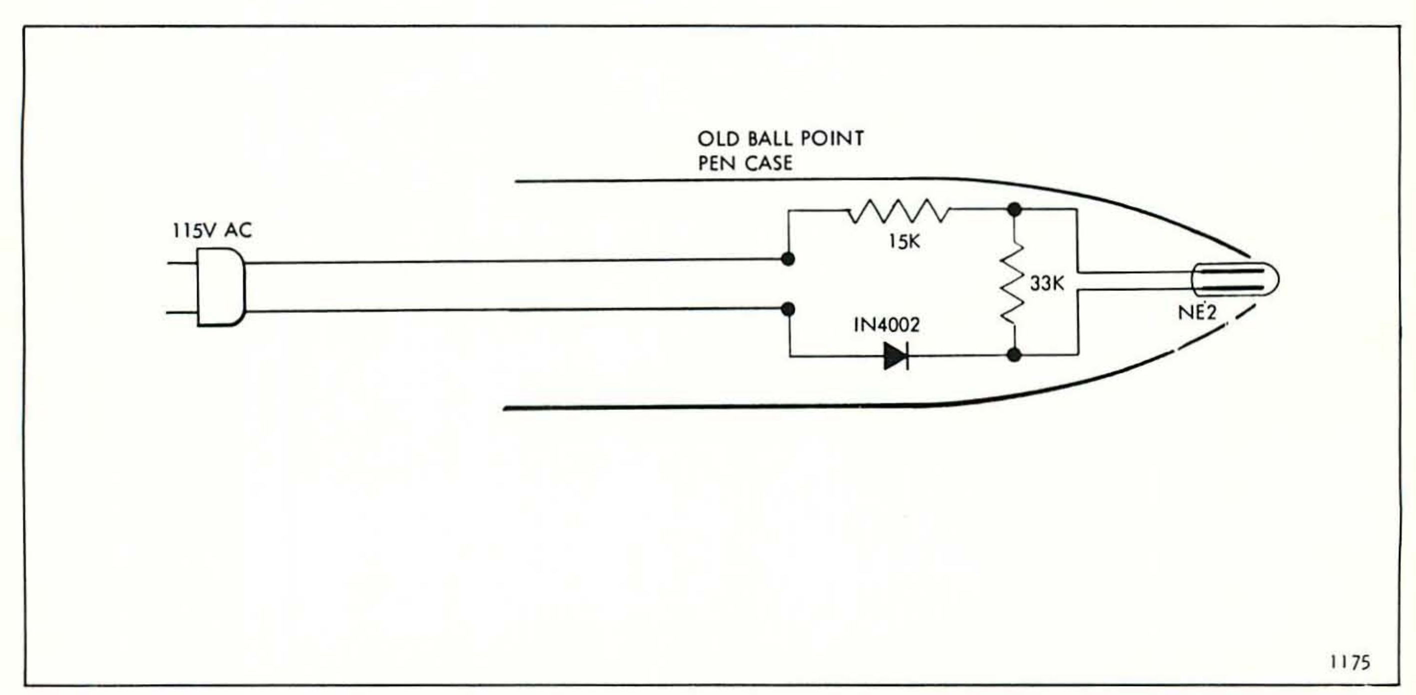



Figure 25. Example of Simple Stroboscope Lamp

Table 4. Capstan Speed Error (for 48 element strobe wheel)

| DRIFT ELEMENTS PER MINUTE | SPEED ERROR-PERCENT AT 7-1/2 IPS | AT 15 IPS |
|---|---|---|
| 2 | 0.056 | 0.028 |
| 4 | 0.112 | 0.056 |
| 6 | 0.168 | 0.084 |
| 8 | 0.224 | 0.112 |
| 10 | 0.300 | 0.150 |

11. Adjust the capstan motor fine speed screw for minimum drift. This should be less than 4 elements per minute, either clockwise (speed too slow) or counterclockwise (speed too fast), when motor is driving the capstan at 15 ips, or a maximum of 2 per minute at 7-1/2 ips. As the adjusting screw is run in, some drive mechanisms show an initial on-speed indication followed by an overspeed which, with further running in of the screw, restores the speed to normal. The latter is the proper adjustment.

12. Remove and reinsert the tape sensor mask several times to assure that the motor returns to the same seated position by observing if any speed change occurs after such cycling. If there is any change, inspect the solenoid system to be certain linkages are not binding or the solenoid failing to bottom. Never adjust the motor pressure to be so heavy that the solenoid cannot seat fully.

13. Set the Variac voltage to 105 volts and repeat the previous step. If OK, return the Variac voltage to 115 volts.

14. Remove the tape sensor mask.

15. Push in the plunger of the incoming capstan pressure roller solenoid by hand (left side of capstan) and back off the pressure roller linkage adjusting screw until the pressure roller does not contact the capstan.

16. Repeat for the outgoing capstan pressure roller.

17. Insert the tape sensor mask and press the PLAY button. The PLAY button should light, and the STOP button should go out. The incoming capstan pressure roller should swing in toward the capstan. Approximately 1/2 second later, the outgoing capstan pressure roller should swing in toward the capstan. In the initial interval, the supply reel motor should accelerate in the rewind direction and the takeup reel motor should quickly race to a high speed. After the 1/2 second initial

interval, the torque on these motors should be noticeably reduced when the outgoing capstan pressure roller swings in. Because both adjusting screws were backed off, neither capstan pressure roller should rotate from contact with the capstan. The above time delay should be about 1 second on 1-inch machines.

18. Adjust the incoming linkage screw until the incoming pressure is just positively driven by the capstan. Give the screw one more full turn in the same direction. Be certain that the solenoid plunger seats completely on repeated operations.

19. Repeat the previous set for the outgoing pressure roller except give the screw a final 3/4 turn.

20. Remove the tape sensor mask, stopping all motors and releasing the pressure rollers.

21. Reel torque measurements are performed next. For this purpose, it will be necessary to employ a 10 ounce or 1 pound spring scale, preferably with a hooked end, and an empty 10-1/2 inch reel. Drill two holes in one of the reel spokes large enough to accept the scale hook. One of these should be at 2 inches from the center of the reel, and the other at 5 inches from the center of the reel. Use the outer one for heavy torque measurements, the inner one for the low torque measurements.

    Place the special reel on the supply reel side and hook the spring scale into the 5-inch radius. Holding the spring scale firmly in place, reinsert the tape sensor mask and press the REWIND button. The STOP button light should go out and the REWIND button should light. Observe the ounce inches of stall torque. See table 5. Remove the tape sensor mask.

NOTE

Table 5 converts the spring scale reading to motor torque. For values not shown in the table simply multiply the spring scale reading in ounces by the radius in inches to find the motor torque in ounce inches.

Table 5. Spring Scale Reading to Motor Torque Conversion Table

| AT 5-INCH RADIUS | | AT 2-INCH RADIUS | |
|---|---|---|---|
| SCALE READING | MOTOR TORQUE | SCALE READING | MOTOR TORQUE |
| 4.0 oz. | 20 oz. in. | 3.00 oz. | 6.0 oz. in. |
| 4.2 | 21 | 3.25 | 6.5 |
| 4.4 | 22 | 3.50 | 7.0 |
| 4.5 | 23 | 3.75 | 7.5 |
| 4.8 | 24 | 4.00 | 8.0 |
| 5.0 | 25 | 4.25 | 8.5 |
| 5.2 | 26 | 4.50 | 9.0 |
| 5.4 | 27 | 4.75 | 9.5 |
| 5.6 | 28 | 5.00 | 10.0 |
| 5.8 | 29 | | |
| 6.0 | 30 | | |
| 6.2 | 31 | | |
| 6.4 | 32 | | |
| 6.6 | 33 | | |
| 6.8 | 34 | | |
| 7.0 oz. | 35 oz. in. | | |

22. Remove the special torque measurement reel from the supply side and place it on the takeup side. Place the spring scale at the 5-inch radius. Replace tape sensor mask and, holding the spring scale firmly in place, press the FORWARD button. The STOP button light should go out and the FORWARD button should light. The torque should be the same as for the rewind motor.

NOTE

Torque of either motor will vary somewhat with angular position due to commutation, but the exact value is not critical. Plus or minus 20% is acceptable.

23. Remove the tape sensor mask, stopping the motors. Reinsert the tape sensor mask. Press the PLAY button. The starting torque of the takeup motor should be approximately as listed in table 6 for initial period until outgoing capstan pressure roller operates. The torque should then reduce to running torque values listed in table 6.

Table 6. Takeup Motor Torques

| TAPE WIDTH | STARTING TORQUE | RUNNING TORQUE |
|---|---|---|
| 1/4 in. | 12 oz. in. | 8 oz. in. |
| 1/2 in. | 24 ox. in. | 8 oz. in |
| 1 in. | 35 oz. in. | 8 oz. in. |

24. Remove the tape sensor mask. Put the special reel and spring scale on the supply reel spindle, using the 2-inch radius hole. Replace the tape sensor mask. Press the PLAY button. The starting torque should as listed in table 7, reducing to the running torque listed in table 7 after operation of outgoing capstan pressure roller.

Table 7. Supply Motor Torques

| TAPE WIDTH | STARTING TORQUE | RUNNING TORQUE |
|---|---|---|
| 1/4 in. | 7 oz. in. | 5 oz. in. |
| 1/2 in. | 10 oz. in. | 7 oz. in. |
| 1 in. | 15 oz. in. | 10 oz. in. |

25. The required torques will generally be realized if the sliders on R61 and R62 are set to maximum resistance for 1/4-inch tape, midway for 1/2-inch tape, and 3/8-inch from minimum end for 1-inch tape.

26. Remove the tape sensor mask. Remove the spring scale and reinsert the tape sensor mask. Check that the LARGE REEL switch is in the center position. Hold the takeup motor by hand so that it cannot turn. Press the FORWARD button. The supply reel motor should rotate slowly in a counterclockwise direction. Slide the LARGE REEL switch to the right. The motor should stop. Slide it to the far left. The motor should run, as in the center position. Remove the tape sensor mask. Place the LARGE REEL switch in the center position.

27. Replace the tape sensor mask and repeat the previous step, holding the supply reel motor and pressing REWIND button. The takeup reel motor should rotate slowly in a clockwise direction. Slide the LARGE REEL switch to the left. The motor should stop. Slide it to the right. The motor should run, as in the center position. Place the switch in the center position and remove the tape sensor mask.

28. Press the POWER button and shut off the power. Connect a DC voltmeter (50 volt scale) from the collector (stud) of the 2N174 regulator transistor (Q60) to ground. Be careful not to ground the test lead. Press the POWER button. It should show 26 to 28 volts. Insert the tape sensor mask and press the PLAY button. Then press the FORWARD button, and then the REWIND button. The voltage should remain at 26 to 28 volts. Reduce the input line voltage to 105 volts and repeat. Only below 105 volts input should the voltage ever drop below 26 volts. Reset the input to 115 volts.

29. Place a reel of tape on the transport, and thread the tape as described under General Operating Procedures.

30. Press the PLAY button. The head cover door should close smoothly within 3/4 second. The tape should be driven by the capstan and wound up by the takeup reel. In starting, it should accelerate smoothly without snapping from the supply reel or throwing a loose loop within the closed loop area. When properly adjusted, the incoming capstan pressure roller should move quickly to contact the tape and then slowly seat under the control of the dashpot, thereby gently increasing the tape pressure on the capstan and giving it a gentle acceleration. Generally, the dashpot must be adjusted to maximum damping. The fork tangs (as shown in figure 23) may be bent slightly, but carefully, to provide proper puck operation. The outgoing capstan pressure idler operates only after the tape is up to speed.

31. Press the STOP button. The head cover door should open instantly and the tape should stop. A reverse motion for an inch or two is permissible.

32. Press the FORWARD button. The head cover door should be open and the tape lifters should operate. Wind the tape to within 100 feet of its end. Press the STOP button. The FORWARD lamp should go out and the REWIND lamp should light, indicating reversed torque, thus bringing the tape to a standstill, at which time the REWIND lamp goes out and the STOP button lights. The tape lifters should drop back to normal.

33. Press the PLAY button. The tape should start as smoothly as it did at the beginning of the reel. If the tape does not start smoothly because the incoming roller is engaging too slowly, the adjustments in step 30 should be repeated until smooth operation is obtained. An optimum point of sufficient puck pressure and damping of puck engagement must be reached for best tape handling. After adjustment, rewind the tape and repeat all steps from 30 on.

34. Press the REWIND button. Somewhere in the middle of the reel, press the STOP button. The REWIND lamp should go out and the FORWARD button should light, indicating reversed torque is applied. When standstill is reached, the FORWARD lamp should go out, and the STOP button should light, and the tape should come to a stop. A few inches overshoot in the reverse direction is permissible.

35. Press the REWIND button. When tape is up to relatively high speed, press the PLAY button. Reverse torque is applied and, when the tape stops the machine should immediately go into the RUN mode, the tape lifters drop back, and the head cover door closes smoothly.

36. Repeat the previous step except from the FORWARD mode.

37. When in RUN mode, press the REWIND button. The pressure rollers should drop out, the head cover door should open quickly, the tape lifters should operate, and the tape should go into rewind.

38. On tape transports with the runout feature, wash off the oxide from the top half of the tape for about one inch. Head cleaning solvent may be used. Place the RUNOUT switch in the STOP position. Rewind the tape about ten feet, and then press the PLAY button. When the clear spot uncovers the incoming photocell, the machine should stop.

NOTE

All tape transports have the RUNOUT switch; but unless this feature is ordered separately, the associated circuit is not included. Its inclusion can be determined by checking for the light-sensing photocell between the two incoming tape guides.

39. Put the RUNOUT switch in the REWIND position. Rewind the tape ten feet and press the PLAY button. When the clear spot uncovers the incoming photpcell, the tape should immediately go into the REWIND mode.

40. Stop the tape. Put the RUNOUT switch in its normal (middle) position. Press the PLAY button. The tape should continue in the RUN mode, past the clear spot without going into STOP or REWIND.

41. Stop the tape and then press the PLAY button. While the transport is in RUN, press the RECORD button. Nothing should happen. While holding the RECORD button depressed, press the PLAY button again. The RECORD button should light. Press the STOP button. The PLAY button and the RECORD button lights should go out.

42. Observe all white relay covers and put the transport through all normal functions looking for sparking contacts. Arcs may be seen through the translucent covers. Particularly look for sparking of contacts 1 and 9 of K1 which controls capstan motor power. Very light arcs are permissible but a bright arc indicates faulty suppressors C4 and R23. These must be functioning or the relay will fail.

43. Check the time required for the head cover door to open and to close as demanded by various functions described above. It should take from 1/2 to 3/4 seconds to close but should open immediately. Adjust the connected dashpot for proper closing time.

44. The tape lifters must swing out fully whenever the tape is in REWIND or FORWARD mode, or in the process of stopping. When released, they must fall back fully so as not to interfere with normal tape motion over the heads. Test their action at the start of a reel, in the center of a reel, and at the end of a reel to be sure they always operate fully and release fully. Check that they do not chatter when the tape reverses direction between FORWARD and REWIND modes. The tape lifters are adjusted by loosening the screw in the end of the shaft, and changing the position of the tape lifter solenoid plunger with respect to the lifter. This can be accomplished from the underside of the transport as shown in figure 24.

45. Be certain that the tape clears the reel flanges with plenty of space to assure freedom from scraping.

46. Record head and reproduce head azimuth is set during signal electronics alignment.

**Flutter**

Flutter is checked by recording a 3 kHz signal and then playing it back into a flutter meter. This is a simple procedure with a record and playback system. However, with record only, or reproduce only, systems it is a bit more complicated. Flutter in these systems can be checked by using the single record or reproduce head stack, but some signal conditioning is necessary. For instance, if the system is a reproduce only system, a 120-kHz bias signal must be applied along with the

3 kHz signal to the reproduce head. If the system is a record only system, a sensitive preamplifier is required to reproduce the recorded signal.

Flutter checks are useful as a troubleshooting aid in determining which component, or group of components, is contributing to the flutter. Using a D&R Ltd, Varo, or equivalent flutter meter, in which three bandpasses are provided, components contributing to flutter can be determined, as shown in table 8. The following steps are to be followed in checking the flutter of a normal machine equipped with standard NAB record and reproduce electronics.

NOTE

It is extremely important that all tape guides, heads, capstan surface, puck idlers, capstan flywheel, and capstan motor spud be thoroughly cleaned with alcohol before making flutter checks.

Table 8. Components Contributing to Flutter

| WAVEBAND | COMPONENT AREA |
|---|---|
| 0.5 to 30 cps | Flywheel and capstan |
| 30 to 300 cps | Capstan motor and reversing idler |
| 0.5 to 300 cps | Used to check overall flutter up to 300 cps |

47. Connect an audio oscillator to the input of the recording electronics. Set the oscillator frequency to approximately 3 kHz (some flutter meters contain their own internal oscillator). Connect the output of the playback electronics to the flutter meter input.

48. Set the capstan motor to high speed (normally 15 ips). Position the tape so that it will start near the beginning of the reel.

49. Record the test signal at 0 VU for approximately 3 minutes. Rewind the tape to the start of the test signal recording.

50. Start the tape and calibrate the input level to the flutter meter. Check the frequency acceptability to the discriminator, then switch to the fullband flutter position (0. 5 to 300 cps). Employ 0. 5% full scale sensitivity. Flutter should not exceed 0. 04% at 15 ips, nor 0. 07% at 7-1/2 ips.

51. Since it is possible for flutter components to cancel in playback because the phase of the recorded flutter may be opposite to the same component being generated during playback, it is necessary to stop and start

the tape during playback at least 15 or 20 times and to accept the worst reading, where the recorded and reproducing phases are additive, as the true worst flutter case. This must be done on each test. Do not check flutter with a playback head while recording the carrier with another head.

52. Make each flutter measurement at about 100 feet from the beginning of the reel, near the center, and again at about 100 feet from the end of the reel.

53. Identify any prominent frequency components in observed flutter, using an oscilloscope. Sources of such components must be determined and steps taken to minimize them if they cause overall flutter readings to exceed specifications. Several sources are:

a. Rotation rate of the capstan. A large component at this rate indicates a faulty flywheel tire.

b. Rotation rate of the reversing idler (same rate as capstan).

c. Rotation rate of the ingoing pressure roller.

d. Rotation rate of the outgoing pressure roller (rate close to that of c).

e. Rotation rate of the capstan motor.

f. Rotation rate of the takeup or supply reel.

g. Resonant component of the reversing idler mass coupled to elasticity of the tape; approximately 100 cycles on the idler for 1/2 inch tape. Try running the tape at high speed over the reversing idler. If the latter produces considerable noise, whining, growling, or hissing, it may mean that the bearings have been damaged; in which case the idler should be replaced, since considerable flutter will otherwise be generated. Do not try to repair the idler. Replace it.

h. Magnetic imbalance in capstan motor causing a 60-, 120-, or 180-cycle component (60-cycle motor) or 50-, 100- or 150-cycle component (50-cycle motor). This is generally prominent at one speed and barely detectable at the other. Make tests at the speed producing the strongest component, if any, and adjust the value of R63 and C64 (see figure 24) to minimize this flutter component. Motors have been trimmed after installation at the factory to minimize this component by the addition small value 600-volt

tubular capacitors. Further adjustments should seldom be required but are made by adding or removing such trimmers.

54. Disconnect the power cord. The hinged plug cover must swing into position, making it impossible to again plug in the power cord without first lifting the hinged cover. Observe that when the cover is in place over the plug the capstan motor is locked mechanically away from the capstan flywheel so that it cannot swing back and forth in shipment.

55. Be certain the capstan motor counterbalance spring is in the proper position for vertical or horizontal service, as required (see figure 14).

56. Replace the cover plate and return the transport to service.

## NAB SIGNAL ELECTRONICS ALIGNMENT

The 3M Brand Professional Audio Tape Recorder is factory aligned for peak performance. All alignment controls are behind the panel on the front of the electronics assembly and are screwdriver adjusted. See figure 26. For access, simply drop the hinged panel downward. The circuit boards and controls are illustrated by a label on the back of this panel. Alignment and adjustments are described first for NAB systems, followed by those for Dynatrack systems.

### NAB Playback Alignment

In the NAB configurations, the playback circuits are normally factory aligned to match Ampex standard alignment tapes as follows:

| Speed (ips) | Tape Width (inches) | Stock No. |
|---|---|---|
| 15 | 1/4 | 01-31311-01 |
| 15 | 1/2 | 01-31311-05 |
| 15 | 1 | 46-90006-01 |
| 7 1/2 | 1/4 | 01-31321-01 |
| 7 1/2 | 1/2 | 01-31321-05 |
| 7 1/2 | 1 | 46-90007-01 |

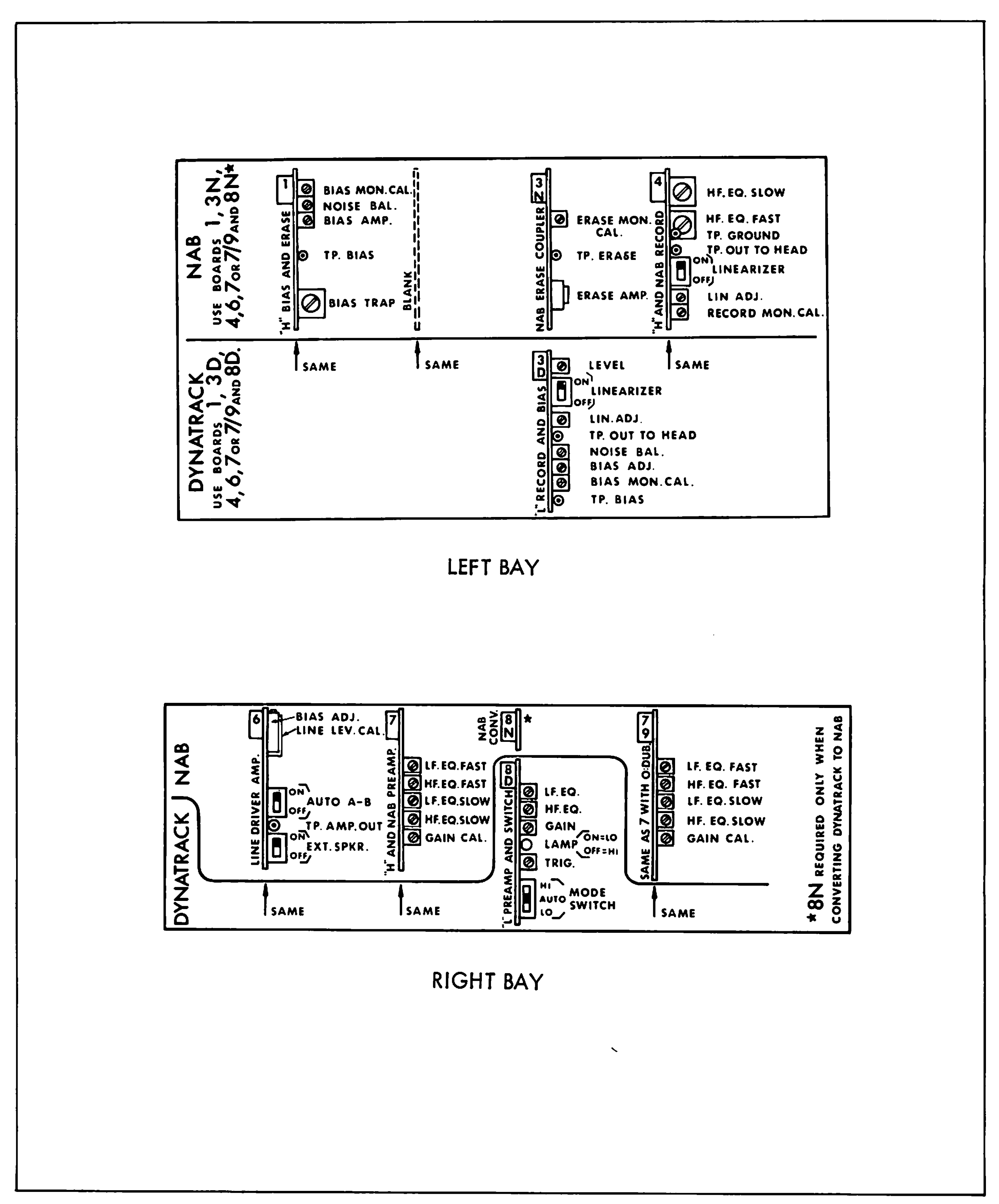



Figure 26. Electronics Assembly Adjustment Locations

The procedure is as follows:

1. Thoroughly degauss and clean all heads.

2. Place the 15-ips standard alignment tape on the tape transport. Be sure that card No. 7 or 7/9 is inserted into slot No. 7.

3. Set the REC. SELECT switch to SAFE and the METER switch to CAL.

NOTE

Be certain that the output impedance and termination switches on the rear of electronics assembly are in the proper position for the connected outgoing line.

4. Remove the head cover plate to expose the head azimuth adjusting screws.

5. Set the transport to operate at 15 ips and press the PLAY button. When the reference tone of 700 Hz appears, the meter should indicate zero VU. If it does within 1/4 VU, proceed to step 6. If not, adjust the GAIN CAL. control on the board in slot 7 until it does.

6. Play the 10 kHz test tone. The output shall be within ±1/2 VU of the 700 Hz reference tone. If not, perform step 9.

7. Rewind the test tape to the 15 kHz tone, and adjust the playback head azimuth (figure 27) for peak output.

8. Connect the outputs from the reproduce electronics corresponding to the top and bottom playback heads to the inputs (Vertical and Horizontal, respectively) of an oscilloscope to produce a lissajous pattern (any other appropriate method to check phasing may be used). Start the alignment tape at 2 kHz and adjust the playback head azimuth for zero phase error. Check each frequency up to and including 15 kHz for phase error. Check each combination of any two tracks and optimize the azimuth for a phase error of less than 90 degrees.

9. Play the 10 kHz test tone and adjust the HF EQ FAST control on card 7, if necessary, to obtain the output level required in step 6.

10. Run through the rest of the test tape. Overall response should be within ±1 VU from 12,000 to 50 Hz. 15,000 may be between +2.5 VU and zero VU. 30 Hz may be ±2 VU from the original 700 Hz reference. Low frequencies may be adjusted with the LF EQ FAST control on the preamplifier board in slot No. 7.

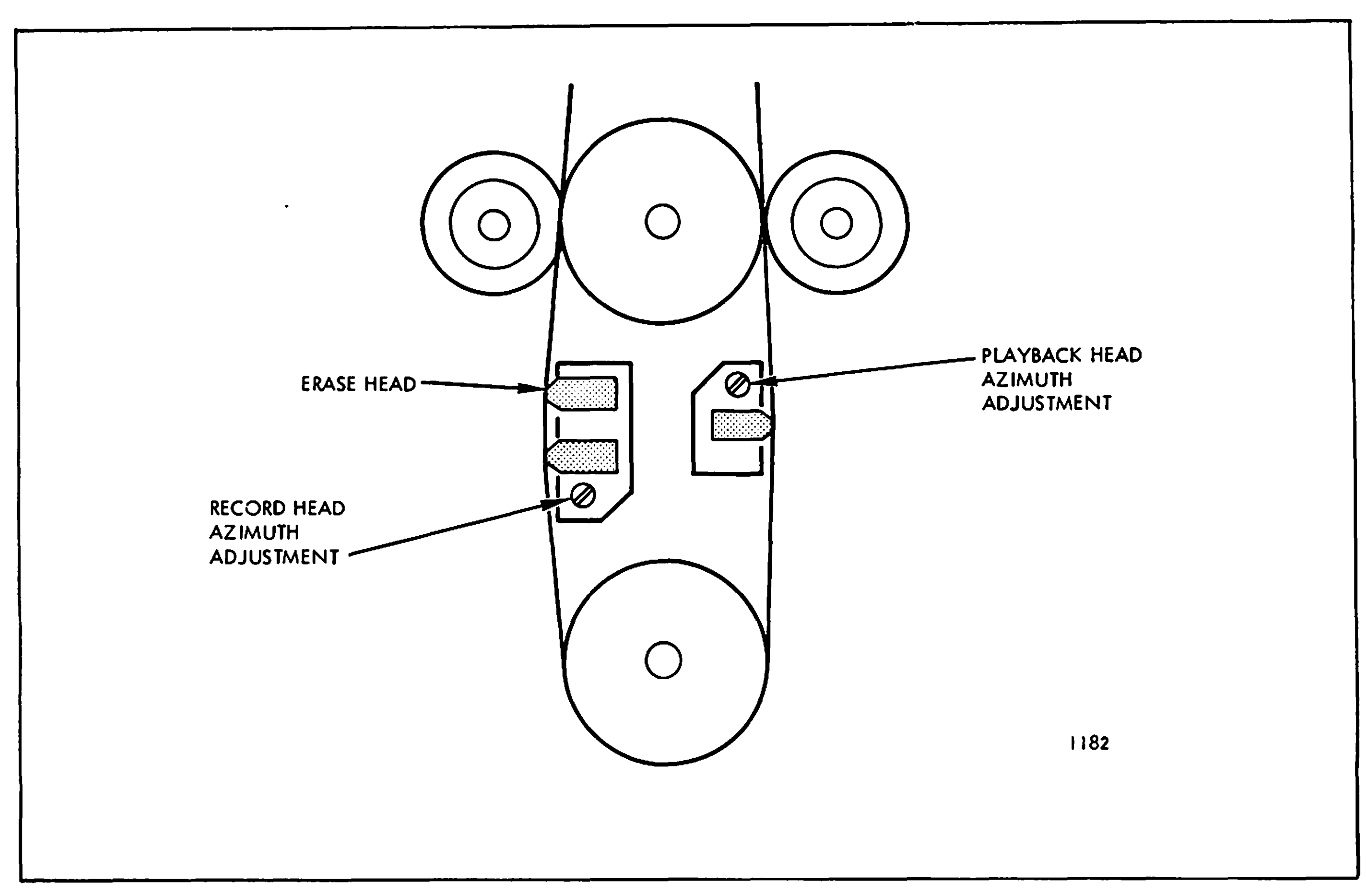



Figure 27. Record and Playback Head Azimuth Adjustments

11. After making the necessary equalizer adjustments, rewind and replay the standard tape to be certain that all frequencies are within limits.

12. Remove the standard tape, preferable "tails" out.

The 7-1/2-ips playback alignment is done in exactly the same manner except that the initial 700 Hz tone and the frequency run are at 10 VU below zero VU. They are followed by 700 Hz at zero VU and this should first be observed, as outlined under preceding step 6. Then rewind the tape to the first 700 Hz band, set the METER switch to SIGNAL, press the B OUTPUT transfer button and adjust the REPRO. LEVEL control to indicate -5 VU. The REPRO. LEVEL control is now set 5 VU higher than normal CAL. level, but it permits more accurate readings. Then check for ±1 VU response 12,000 to 50 cycles and ±2 VU 15,000 to 30 cps, as outlined in steps 9 and 10. Adjusting HF EQ SLOW and LF EQ SLOW rather than HF EQ FAST and LF EQ FAST. These are automatically switched in when the tape speed is changed. The head azimuth adjustment and GAIN CAL adjustment made at 15 ips should not be disturbed unless 7-1/2 ips is to be considered the speed of primary usage.

## NAB Record Alignment

The alignment procedure to follow should be carried out, using a length of tape from the supply to be used for subsequent recording, whenever possible. The 3M Brand Professional Audio Recorder is factory aligned to use 3M types 201, 202 and 203 tape. It is essential that the preceding playback alignment be checked before record alignment.

## 15 IPS Tape Speed Alignment

1. Set REC. SELECT switch to RDY., the METER switch to SIGNAL and press the A transfer button. The RECORD LEVEL control need not be adjusted from its normal operating position if it has been locked in place. The LINEARIZER switch on the H and NAB Record Board in slot 4 should be in the OFF position. Connect an audio signal generator to the recorder input (J101).

2. Set the audio signal generator to 1000 Hz and raise the level until the VU meter indicates 0 VU.

3. Check to be sure that meter continues to indicate 0 VU as the oscillator frequency is changed between 30 Hz and 15,000 Hz. If there is more than ±1/2 VU deviation in these indications, the reasons must be discovered before continuing with the checkout. Possible reasons may be unstable oscillator output versus frequency, improper termination, shunting capacitance on the input line, or capacitive feed (one lead open between the oscillator or recorder).

4. Listen with a monitor speaker or earphones to be sure no strong noise or hum component is picked up at the input terminals in addition to the oscillator tone.

5. Start the recorder in RECORD mode. Turn the METER switch to CAL.

6. Adjust the BIAS AMP control on the Bias and Erase Amplifier Board in slot 1 to give a maximum indication on the VU meter for the 1000 Hz signal. The maximum should occur at zero VU. If the meter indicates other than 0, adjust the input signal level for a 0 indication. Turn the METER switch to SIGNAL, press the A OUTPUT button and adjust the RECORD MON. CAL. control on the H and NAB Record Board in slot 4 until it again indicates 0. Return the METER switch to the CAL position.

7. Set the oscillator to 7000 Hz. Adjust the azimuth of the record head stack to give a maximum indication on the VU meter. Reset the oscillator to 15,000 Hz and again carefully adjust the record head azimuth for maximum. Using a similar method as in step 8 of the NAB Playback Alignment, adjust the record head azimuth screw (figure 27) for less than 90 degrees phase error between any two tracks.

8. Make a frequency run from 15,000 to 30 Hz and observe the VU meter. If it lies within ±1 VU from 40 to 15,000 Hz, and ±2 VU at 30 Hz, the performance may be considered satisfactory.

9. If the frequency response is not within acceptable limits, adjust the HF EQ FAST control on the H and NAB Record Board in slot 4 to bring response within limits.

### 7-1/2 IPS Tape Speed Alignment

Having checked the playback circuit and adjusted it for flat response as outlined under NAB Playback Alignment, 7-1/2 inch speed, leave the REPRO LEVEL control set in the position established under that procedure which resulted in the standard tape signals recorded at -10 VU showing -5 VU on the meter. Then proceed as follows:

1. Perform steps 1, 2, and 3 of the procedure outlined under NAB Record Alignment, 15 ips Tape Speed Alignment.

2. Reduce the input signal level so that the meter indicates approximately -10 VU.

3. Listen with speaker or phones to be sure there is no strong noise or hum component picked up at input terminals in addition to the oscillator tone.

4. Put the recorder into record mode. Press the B OUTPUT transfer button. The meter should indicate approximately -5 VU.

5. Adjust the BIAS control on the Bias and Erase Board in slot 1 for maximum VU indication at 500 Hz. Readjust input signal level if necessary to get -5 VU.

6. Set the oscillator to 5000 Hz. Adjust the azimuth of the record head stack to give a maximum indication on the VU meter. Reset the oscillator to 15,000 Hz and carefully adjust azimuth for maximum indication. If primary speed of interest is 15 ips, skip this step.

7. Make a frequency run over the range of 30 to 15,000 cycles and observe the VU meter. If it indicates within ±1 VU from 40 to 12,000 Hz, and ±2 VU from 30 to 15,000 Hz, the performance may be considered satisfactory.

8. If the frequency response is not within acceptable limits, adjust the HF EQ SLOW control on the H and NAB Record Board in slot 4 to bring response within limits.

9. Return the signal generator to 500 Hz. Adjust the REPRO. LEVEL control to obtain approximately -10 VU indication. Turn the METER switch to CAL. Raise the input level to obtain 0 VU indication on meter.

10. Press the A OUTPUT transfer button and turn the METER switch to SIGNAL. The meter should indicate 0 VU. If it does not, adjust the RECORD MON. CAL. control on the H and NAB Record Board, slot 4, until a zero indication is obtained. If there is a discrepancy in this adjustment between the 7-1/2 and 15 IPS setting, adjust it for the speed most important to the application.

NOTE

The above procedure permits frequency response measurements to be made at a signal level 10 VU below the zero reference level. This is essential with low speed tapes (7-1/2 ips or slower) because of the heavy recording preemphasis used for higher frequencies.

**Dynamic Range Adjustment (NAB)**

1. Connect the signal generator to a calibrated attenuator box and terminate the output of the box. Feed this output to the input of the channel under test. Connect a distortion analyzer and a vtvm to the output terminals. Use a reel of tape of the type for which the recorder has been aligned. The tape speed should be 15 ips.

2. Before beginning noise measurements, it is absolutely essential to degauss and clean all heads very carefully. Turn off the main recorder power switch during degaussing. Connect a high gain power amplifier and loudspeaker to the output terminals of the recorder. Short circuit the input terminals. The METER switch should be set to ERASE with the B OUTPUT lamp lit.

3. Advance the monitor gain so that the tape noise is heard loudly.

4. Remove the 3N card. Press the RECORD button. Adjust the NOISE BAL. control on the Bias and Erase board in slot 1 to minimize thumping and popping noises. Press the STOP button.

5. Reinstall the 3N board, using an extender board. Press the RECORD button. Adjust the ERASE AMP. coupling capacitor on the 3N board to attain minimum audible noise. The point of minimum noise will be found either slightly above or below peak erase current, as observed on the meter.

6. Press the STOP button. Remove the extender board and plug board 3N into its normal position. Check again to be certain that noise has not increased.

7. Reduce the monitor gain to the normal setting. Set the oscillator to 1000 Hz and use a decade attenuator to insert a 19 db loss.

8. Set the LINEARIZER switch on the H and NAB Record Board in slot 4 to OFF.

9. Put the recorder into the RECORD mode. The B OUTPUT lamp must be lit. Readjust the input level to obtain 0 VU on the meter.

10. Measure distortion on the wave analyzer. It should be just under 1% total harmonic distortion.

11. Rewind some of the tape and play it back. Observe the distortion. If it is lower, it means that high-frequency bias current is leaking into the distortion analyzer during recording and all measurements will have to be made through a low-pass filter or during playback only.

12. Return to recording the 1000 Hz signal at 0 VU. Remove 6 db from the calibrated attenuator. The distortion meter should indicate just under 3% total harmonic distortion. Observe the vtvm indication.

13. Disconnect the oscillator from the input to the attenuator and record some tape with this input signal removed, (approximately 30 seconds of tape).

14. Play back the tape so recorded, and read the vtvm. The difference in readings between tape recorded in steps 12 and 13 represents the signal-to-noise ratio measured from the 3% distortion point without the linearization circuit in operation. Place the LINEARIZER switch to ON.

NOTE

Noise figures stated in the system specifications are obtained by the use of bandpass filters. Such filters exclude all noise outside the stated pass-band.

## Miscellaneous Adjustments and Circuit Arrangements

When the METER switch is set to the BIAS position during recording, the VU meter indicates a steady level, determined by the amplitude of bias current in the

record head. When this current is optimized, the meter indication can be adjusted to a convenient reference by means of the BIAS MON. CAL. control on the Bias and Erase Board in slot 1. This provides a ready check of bias at any time.

When the METER switch is set to the ERASE position during recording, a similar check is provided for the magnitude of the erase current. This may be calibrated to read any convenient level by means of the ERASE MON. CAL. control on the NAB Erase Coupler Board in slot 3.

The recorder is normally set up to supply a 600-ohm line at the +4 dbm level. The output impedance switch can be set to select either 600 ohms or 150 ohms, and the termination switch can be set to 600, 150, or open position. If it is desired to change the working line level from +4 dbm to some other level, it is necessary to change certain resistors on the Line Amplifier Board in slot 6. A chart of values is shown in the circuit description for this board.

The use of the PILOT connector and the REMOTE METER connector are fully described under circuit descriptions.

The linearizer adjustment should be undertaken in accordance with the following outline. If the user feels the adjustment has been misset it may be disconnected by setting the LINEARIZER switch to OFF until properly aligned.

As delivered, the machine is adjusted for use with Scotch brand low-noise tape types 201, 202, and 203. Under normal conditions no adjustments should be necessary. The switch should always be in the ON position except when distortion measurements are being made. If the machine is to use a different type of tape, the LIN ADJ. control may require trimming. This is best done with aid of a wave analyzer. Adjustment is done as follows:

1. Set the METER switch to CAL position.
2. Make the frequency response and dynamic range adjustments and measurements outlined above for the type of tape used
3. Set LINEARIZER switch to OFF position.
4. Raise record level to give 3% third harmonic distortion.
5. Set LINEARIZER switch to the ON position.
6. Adjust LIN ADJ. control for minimum distortion.
7. Adjust input level to again achieve 3% third-harmonic distortion.
8. Repeat steps 5, 6, and 7 until no change in record level is necessary.

9. Adjust record level to provide zero VU playback level.

10. Press the A OUTPUT button and set METER switch to SIGNAL. Meter indication should remain at 0 VU. If it is higher or lower, adjust RECORD MON. CAL. control to obtain zero indication.

If it should be necessary to adjust the linearizer without the aid of a wave analyzer, a satisfactory approximation to the ideal adjustment can be made with a vtvm as follows:

1. Set METER switch to the CAL. position and LINEARIZER switch to OFF.

2. Using a standard alignment tape establish a reference level on the vtvm.

3. Using the desired tape type adjust the record level to obtain a signal 6 VU above 0 VU.

4. Set LINEARIZER switch to ON. Output level should rise 0.8 VU if the linearizer is properly adjusted. If not, adjust the LIN ADJ. control to achieve the difference.

5. Set the LINEARIZER switch to OFF. If output level is changed from +6 VU, readjust record level to again obtain +6 VU.

6. Repeat steps 4 and 5 until the 0.8 db difference is attained upon operation of LINEARIZER switch and the indicated operating level is +6 VU with the switch in the OFF position.

7. Reset RECORD MON. CAL. control if necessary as outlined above.

Series 400 recorders equipped to provide overdub recording capability should be set up in accordance with the following procedure:

NOTE

> For maximum flexibility, it is desirable to employ a No. 7 board for normal reproduction, and a permanently installed No. 7/9 board in slot 9 to provide overdub facilities. When furnished in this manner the recorder is considered having permanent overdub capability.

1. Place a No. 7/9 board in slot 9. Position the REC. SELECT switch to the O. DUB position.

2. Set the METER switch to CAL. Press the PLAY button. Adjust the GAIN CAL control on the 7/9 card for zero VU on the meter when the 700 Hz signal is playing from the standard alignment tape. Press the STOP button.

## DYNATRACK ELECTRONIC ALIGNMENT

The Dynatrack system is designed for operation only at 15 ips. Refer to pages 1 to 4 for a description of the Dynatrack system. In a normal NAB system, one track is assigned to each electronics assembly unit and provides for recording and playback of a separate signal input and output channel. In the Dynatrack system, two tracks are employed per signal channel. The heads will have been properly connected to the electronics assemblies of a factory assembled Dynatrack system but for systems delivered for NAB operation, observe the following conversion procedure. It is assumed that the Dynatrack kit has been installed in accordance with the Dynatrack installation procedure which accompanies the kit.

1. Reconnect the head cables to the electronic assemblies in accordance with the assignment shown in table 3.

2. Observe figure 26. Be sure the Dynatrack boards are installed as shown for electronic assemblies to be employed for this operation. Those not so converted should retain the NAB arrangement, also shown in figure 26. Figure 26 is reproduced on the inside of the electronics assembly cover door.

3. Set the REC. SELECT switch on all nonconverted NAB electronic assemblies to SAFE and the A-B OUTPUT selector on A. Deactivate the automatic transfer by setting the AUTO A-B switch on each no. 6 board in the NAB assemblies to OFF.

4. Put the NAB standard alignment tape for 15 ips on the transport.

5. Set the REC. SELECT switch to SAFE and the METER switch to CAL. Set the MODE switch on the 8D board to the H1 position. The pilot lamp should go out.

NOTE

Be certain output impedance and termination switches on the rear of electronics module are in proper position for the connected outgoing line.

6. Put the machine in the PLAY mode at 15 ips. When the reference tone of 700 Hz appears, the meter should indicate 0 VU. If it does within 1/4 db, proceed to step 7. If not, adjust the GAIN CAL. control on the board in slot 7 to obtain this indication.

7. Play the 15,000 Hz azimuth check tone and adjust the playback head azimuth (figure 27) for peak output as indicated on the VU meter.

8. Play the 10,000 Hz test tone, and adjust the HF EQ FAST control on board 7 to obtain 0 VU on the meter. Play through the tape, and adjust the LF EQ FAST control on board 7 so that all frequencies between 50 and 10,000 Hz fall within ±1 VU of the 700 Hz reference level. 15,000 Hz shall be no more than +2.5 VU from the 700 Hz reference.

9. After making necessary equalizer adjustments, rewind and replay the standard tape to be certain that the response at all frequencies is within the limits specified in step 8.

10. Rewind the tape.

11. Place the MODE SWITCH on the 8D board in the LO position. The pilot lamp should light. Set the equalizer switch behind the extractor handle to the lower OFF position. (This switch is not shown in figure 26.)

12. Put the machine in the PLAY mode. When the reference tone of 700 Hz appears, the meter should indicate 0 VU. If it does, within 1/4 VU, proceed to step 13. If it does not, adjust the GAIN control on board 8D until it is within limits.

13. Play the 10,000 Hz test tone, and adjust the HF EQ control on board 8D to obtain 0 VU on the meter. Play through the tape, and adjust the LF EQ control on board 8D so that all frequencies between 50 and 10,000 Hz fall within ±1 VU of the 700 Hz reference level. 15,000 Hz shall be no more than +2.5 VU from the 700 Hz reference.

14. Set the MODE SWITCH on board 8D to the AUTO position (mid position). Rewind the alignment tape to permit playing the 5 kHz tone. Adjust the TRIG control on card 8D so that the neon lamp is on the verge of extinction in the presence of the tone as indicated by slight flickering.

15. Set the equalizer switch behind the extractor handle on card 8D to the upper ON position. (This switch is not shown in figure 26.)

## Dynatrack Record Alignment

This alignment procedure should be carried out, using a length of tape from the supply to be used for subsequent recording. The 3M Brand Professional Recorder is factory aligned to use 3M types 201, 202, and 203 tape.

The procedure accomplishes the following. It checks the H track for alignment to NAB standards, adjusts the level and frequency response on the L track, and compares the two tracks for identity of level and frequency response.

NOTE

Do not upset any of the playback adjustments for either the L or H track which were established above.

## H Track NAB Alignment

1. Set REC. SELECT switch to RDY and the METER switch to SIGNAL. Press the A OUTPUT transfer button. Place the LINEARIZER switches on the L record board (3D) and on the H record board (4) to the OFF position. Place the MODE SWITCH on the L preamplifier and switch board (8D) in the HI position.

2. The RECORD LEVEL control need not be adjusted from its normal operating position if it has been locked in place.

3. Connect an audio oscillator to the SIGNAL IN connector and set the the oscillator frequency to 400 Hz. Adjust the oscillator output level until the VU meter reads 0 VU.

4. Check that the meter continues to indicate 0 VU if the oscillator frequency is varied from 30 to 15,000 Hz. If there is more than 1/2 VU deviation in these indications, the reason must be determined before continuing. Set the oscillator to 1000 Hz.

5. Listen with a monitor speaker or earphones to be sure that there is no strong noise or hum component picked up at the input terminals in addition to the oscillator tone.

6. Put the recorder in the RECORD mode. Turn METER switch to CAL. The meter should indicate 0 VU.

7. Adjust BIAS AMP. control on board 1 to give a maximum indication on the VU meter for the 1000 Hz tone being recorded on the H track. The maximum should occur at 0 VU. If the meter indicates other than 0, adjust the oscillator output level until 0 indication is obtained. Then with the A OUTPUT lamp lit, turn the METER switch to the SIGNAL position, and adjust the RECORD MON. CAL control on board 4 until it again indicates zero. Return the METER switch to the CAL position.

8. Set the oscillator to 7000 Hz. Adjust the azimuth of the record head stack to give a maximum indication on the VU meter. Set the oscillator to 15,000 Hz and carefully trim the azimuth adjustment for maximum.

9. Make a frequency run from 15,000 to 30 Hz while observing the VU meter. If it is within ±1 VU from 40 to 15,000 Hz and ±2 VU at 30 Hz, the performance may be considered satisfactory.

10. If the frequency response falls outside these limits, adjust the HF EQ FAST control on board 4 to bring the response within limits. This completes frequency and amplitude alignment of the H track.

## L Track Alignment

Align the L track for frequency response as follows:

1. Set the MODE switch on the 8D board to the LO position. Turn the METER switch to SIGNAL.

2. Set the oscillator to 250 Hz and reduce the input signal level by approximately 20 db below the 0 VU level by adjusting the oscillator output control or by using a step attenuator.

3. Put the machine in RECORD mode. Transfer the OUTPUT to B.

4. Raise the signal level by the REPRO. LEVEL control until a convenient playback level is indicated. Lock the control in this position. If the reading is still several db below 0 VU, an external VTVM fed from the output of the channel may be useful for making measurements.

5. Set the oscillator to 1000 Hz. Adjust the BIAS ADJ. control on the 3D board to obtain a maximum reading on the meter. Should this result in a higher meter indication, reset the oscillator output to again obtain the convenient reference as in step 4.

6. Make a frequency run from 15,000 to 30 Hz while observing the meter. If the response is within ±1 VU (db) from 40 to 15,000 Hz and ±2 VU (db) at 30 Hz, the performance may be considered satisfactory.

7. If the frequency response is not within acceptable limits at the high frequency end of the spectrum, adjust the BIAS ADJ. control on the 3D board slightly.

## Combined H-L Dynatrack Performance

To adjust the relative amplitudes of the signals in the two tracks comprising a dynatrack channel, it must be borne in mind at this point that the playback levels of both tracks have been properly set using a standard alignment tape and that the recording level in the H or NAB track has been properly established. This leaves only the adjustment of the L track recording level to be determined.

1. Set the MODE SWITCH on the 8D board to HI, the METER switch to the SIGNAL position, and press the OUTPUT transfer B button.

2. Record 700 Hz at a level that will indicate zero VU on playback by adjusting the output amplitude of the oscillator.

3. Set the MODE SWITCH on the 8D board from HI to LO. The meter indication should not change. If it does, adjust the GAIN control on the 3D board until meter indicates zero.

4. The LINEARIZER on board 3D will probably not require adjustment. It may be checked and adjusted as outlined for the NAB track. In this case, however, use 500 Hz for the alignment procedure.

5. Unlock the REPRO. LEVEL control knob and return it to approximately the normal operating position. Return the MODE SWITCH to the AUTO position.

6. Check the operation of the trigger circuit as indicated by the neon lamp on board 8D. While in the record mode, feed various frequencies into the channel. Raise and lower the level slowly by adjusting the oscillator output in order to cause the lamp to turn off and on. At 1000 Hz, this should occur at about 0 VU and at lower levels as the frequency is raised until a level of about -15 VU causes extinction of the lamp at 15,000 Hz. There is no requirement for lamp extinction at any frequency lower than 400 Hz.

7. Listen carefully in a high level monitoring system for clicks and pops when making the tests in paragraph 6 above. They should be almost completely inaudible.

8. Return the LINEARIZER switches on the L record board (3D), and on the H record board (4) to the ON position.

### Dynamic Range Measurement, Dynatrack

1. Connect signal generator to a calibrated attenuator box and terminate the output of the box. Feed this output to the input of the recorder channel under test. Connect a distortion analyzer and a vtvm to the output terminals. Connect an ASA weighting network in accordance with figure 28 in series with the input of the vtvm. Use a reel of tape of the type for which the recorder has been aligned under the above paragraphs. Select 15 ips tape speed.

2. Before beginning noise measurements, degauss all heads carefully. Turn off the recorder POWER switch during degaussing. Connect a high gain power amplifier and loudspeaker to the output terminals of the recorder. Short circuit the input terminals. Turn the METER switch to SIGNAL and press the B button. Set the MODE SWITCH on 8D board in slot 8 to HI. Set both LINEARIZER switches to the OFF position.

3. Turn up the gain so that tape noise is heard loudly.

4. Adjust NOISE BAL control on Bias and Erase Amplifier Board in slot 1 to minimize thumping and popping noises.

5. Set the MODE SWITCH to LO.

6. Adjust the NOISE BAL control on the L Record Amplifier Board in slot 3 to minimize thumping and popping noises. This test will require more gain in the loudspeaker amplifier in order to be heard.

7. Set the MODE switch to HI.

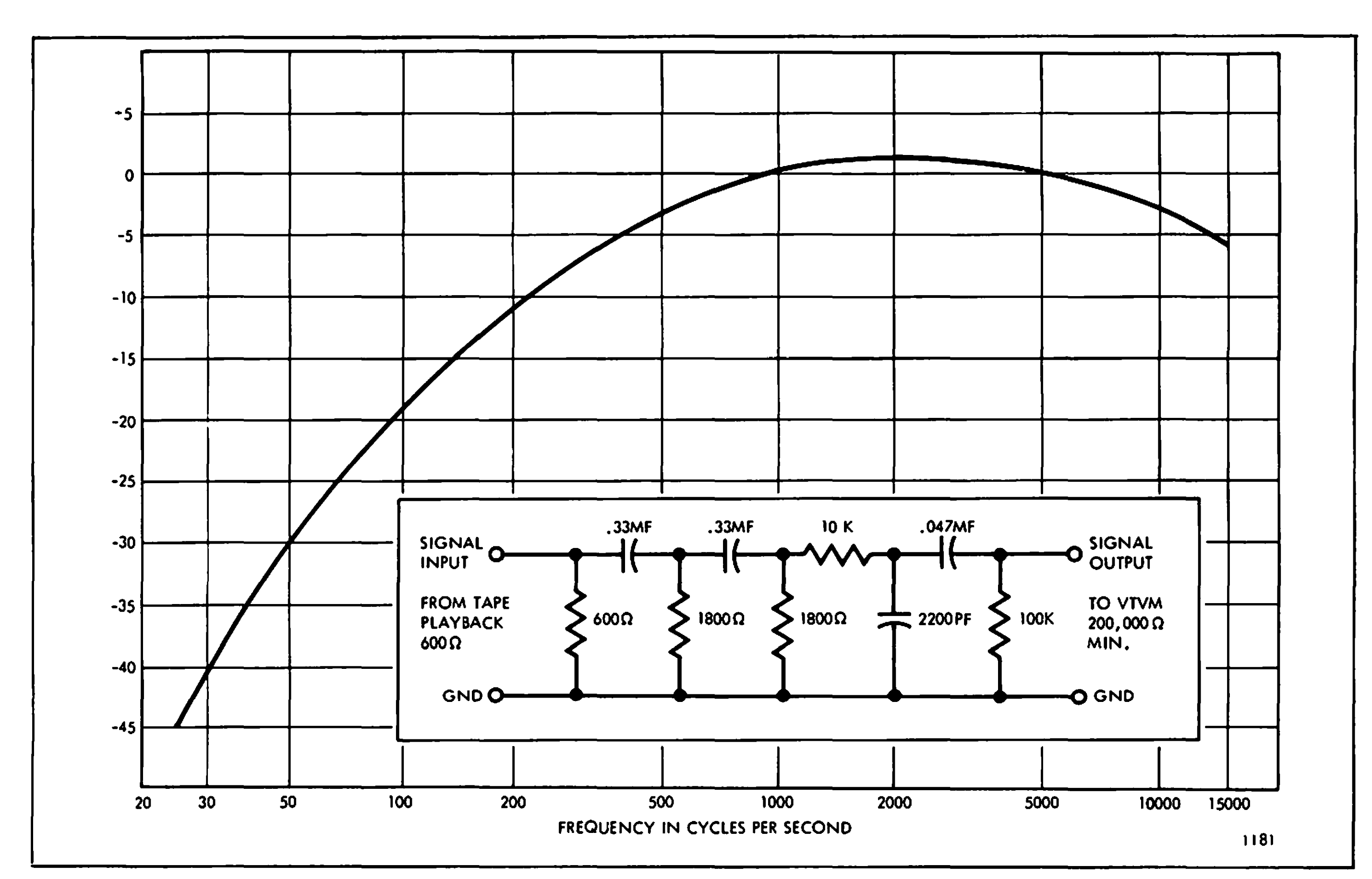



Figure 28. ASA Weighting Network and Response Curve

8. Set the oscillator to 400 Hz, and insert 19 db attenuation in the calibrated attenuator box.

9. Put the recorder in the record mode. The B OUTPUT transfer button must be lit. Readjust the oscillator gain control (not the attenuator) to obtain zero VU indication on the meter.

10. Measure the distortion on the wave analyzer. It should be just under 1%.

11. Rewind some tape and play it back. If there is a significant improvement in the distortion reading it means that high-frequency bias current is leaking into the distortion analyzer during recording. In such instances measurements must be made through a proper low pass filter or only on playback.

12. Change the oscillator frequency to 1000 Hz. Check by recording the signal to be certain that the VU meter still indicates zero level.

13. Remove 6 db of attenuation from the calibrated attenuator. The VU meter will be off scale. Readjust the distortion meter to analyze 1000 Hz. It should show 3% total harmonic distortion.

14. Observe the indication on the vtvm which is fed through the ASA weighting network from the output of the recorder.

15. Disconnect the oscillator by unplugging it from the input to the attenuator, while the recorder is still in the record mode and short circuit the input terminals. Continue to record for about 30 seconds.

16. Rewind the tape far enough so that the 3% level tone will be first reproduced, followed by tape recorded with no input signal. Set the MODE SWITCH to AUTO.

17. Play back the tape. During the tone the pilot lamp on the 8D board in slot 8 should be out. Observe the vtvm reading. When the tone runs out, the pilot lamp should light. Again read the vtvm. The difference in readings is the weighted signal-to-noise figure. It should be 80 db. This reading may be attained only after several rotations of the supply reel since a certain amount of printing from the high level (+6 VU) signal to the quiet tape is inevitable in the first few layers.

18. Return both LINEARIZER switches to the ON position.

## HEADS

This recorder can be obtained with a variety of head configurations. Heads are mounted on a plate which provides azimuth adjustment of both record and playback head stacks. Erase heads are fixed in position. The plate carries a connector which mates with another permanently mounted in the trânsport. The transport connector has leads attached to it which connect to the electronic assemblies. All of these connectors are physically interchangeable. It is imperative that the number and letter coding be observed.

To change a head assembly, first remove the head cover trim, then the transport cover plate, and then the reversing idler (held in place by one screw under the main casting). See figure 23. Next remove the two metal trim plates (one on either side of the capstan and idler). Remove the screws that hold the head mounting plate in place. Insert two screws into the tapped holes at either end of the connector plug. As these are screwed down, they will jack up the plate and gently separate the connectors. An alternate head assembly may be installed by following the reverse procedure. Head stacks of various physical heights may be interchanged. On machines with one-half inch capstan height any heads for up to 1/2 inch tape width may be mounted in place. For machines with one-inch capstan height, any heads for up to 1 inch width may be mounted.

## TAPE GUIDES

The function of the tape guides is to cause the tape to be fed into the Isoloop without lateral shifting, so that the recorded pattern remains within the NAB margins, and to cause the tape to wind evenly onto the reels so that each turn lies on top of the other and does not contact either reel flange.

The primary tape path reference is the lower flange of the ingoing guide which guides the tape into the Isoloop.

When head assemblies are changed to accomodate a different tape width, it is necessary to change the tape guides. These may be removed by unscrewing them from the main casting. Replace with guides having the appropriate height. Remember the guides having the narrower opening (a few thousandths of an inch) go on the incoming (supply) side of the capstan. The wide ones go on the takeup side.

This guide surface is set at a fixed distance from the capstan assembly machined surface, on which the heads are mounted. The desired guiding is one that feeds tape into the Isoloop with the edges touching, but not binding on the flanges of the incoming guides. The outgoing tape guides are wider. Their flanges do not guide the tape in the normal running mode.

Tape guides will not normally require adjustment unless the machine is converted for a wider, or narrower tape. New guides, heads, and reel hubs are finished as part of a conversion kit. The replacement guides are installed by their center screws. Proper flange height is established by holding machining and plating tolerances, and no shimming or threaded adjustment is required.

To assure that tape guiding is satisfactory and that no damage or misadjustment has occurred, the following examination can be made.

1. The lower edge of the tape (inner edge of the tape if the transport is mounted vertically) registers lightly on the lower (inner) flange of the incoming guide nearest the capstan. The tape does not move up or down on the reversing idler as the tape direction shifts from forward to rewind.

2. The wear pattern on the heads and guides is straight-sided. (Not keystoned, which would indicate uneven tension across the tape.) There must be no evidence of a 1/4-inch groove on 1/2-inch guides and heads, or a 1/2-inch groove in 1-inch heads, etc.

## REEL HUBS

The function of the reel tables and holddown hubs is to hold the tape reels in plane of the tape path, so that tape is fed out and spooled without scraping on either reel flange. The hub is held in place by a shaft collar on the reel motor shaft. See figure 29. Position of the collar is secured by two setscrews. After a reel is installed the finned, spring-loaded top of the knob may be turned a few degrees clockwise, which will lift the three small bevelled projections up out of the reel keyway slots to rest on the top of the reel, locking it firmly to the reel table. Reel table height should not require readjustment unless a reel motor is replaced.

A small 1/4-inch center reel table and hub is available to accommodate home-recorder type reels. To install this reel table, the large coinslot center screw in the NAB reel hub is loosened, the top lifted off, and three small Phillips screws removed. The 1/4-inch table and hub are then installed, using the three flat-head screws. The 1/4-inch reels are held in place by turning the top part of the spindle so that the bevelled keys rest on top of the reel, as in the NAB hub.

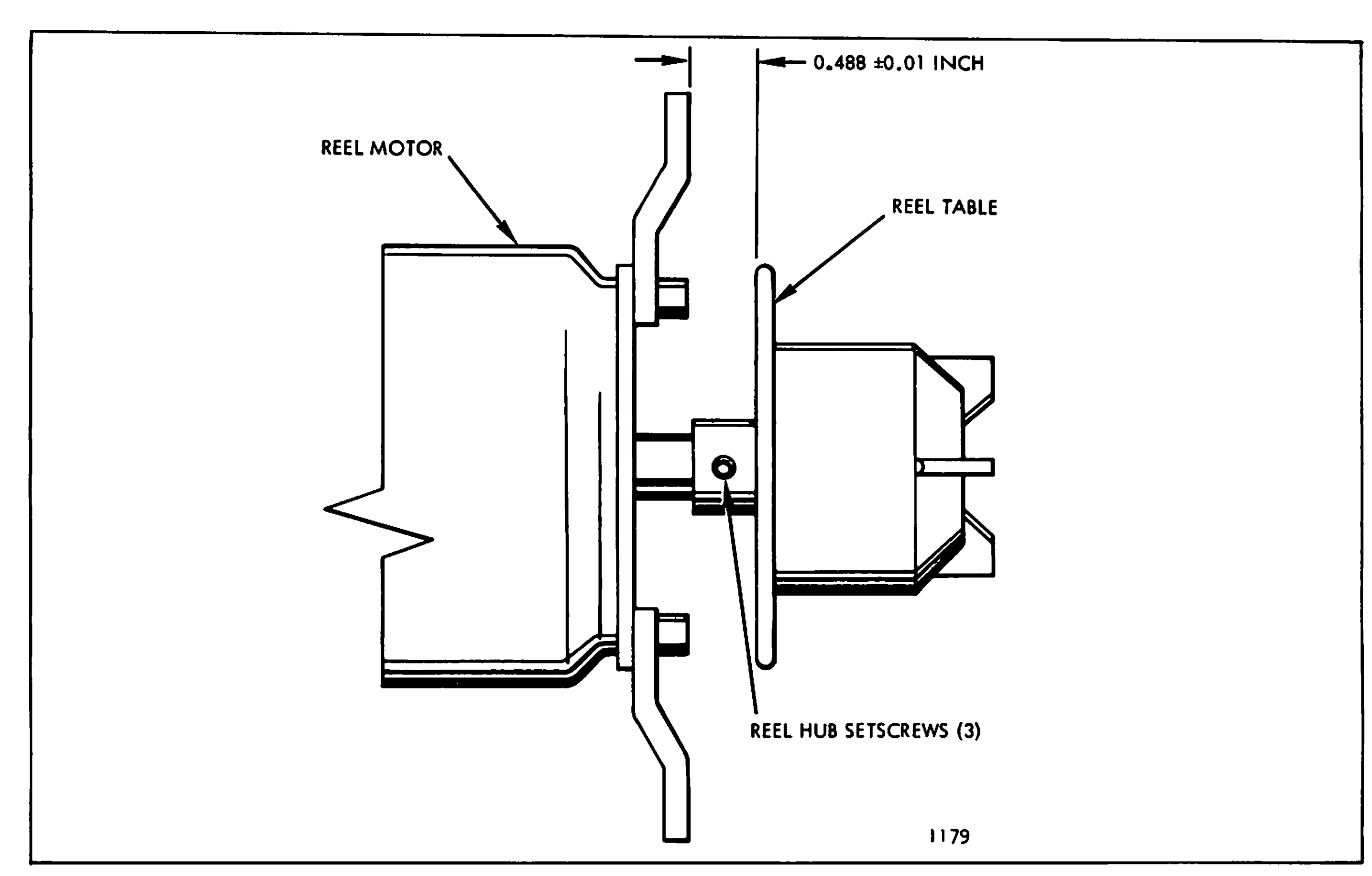



Figure 29. Reel Hub Adjustment

# MAINTENANCE

Maintenance of the 3M Brand Professional Audio Recorder will normally consist of adjustment and repair as needed. Adjustments are presented in the Alignment and Adjustment section. This section contains special notes concerning maintenance and troubleshooting.

## GENERAL PRECAUTIONS

The following paragraphs contain some general precautions which should be observed when performing maintenance on the recorder.

1. Do not strike the reversing idler. It is delicate and located in a vulnerable position at the front of the mechanism. If damaged, flutter will be excessively high.

2. Exercise great care in installing head mounting plates. They can be screwed into place with a head lead pinched between the mounting plate and the transport casting, thus breaking wire insulation or cutting a head lead. Be certain no leads will get in the way before installation.

3. Exercise great care in removing and replacing the mu metal cover over the playback head stack. The slot at the rear of the cover can slice head lead insulation, thereby grounding head leads or actually cutting through them. Be certain that this cover is fully seated so that the lower lip will not scrape on tape as it passes by. Otherwise tape edge may be cut and bad tracking over the heads may result.

4. Do not go from REC. to SAFE when the recorder is operating in the RECORD mode. First stop the transport. This will prevent a thump from being recorded in the tape and magnetization of the record head.

5. Do not remove any of the electronics cards when the power is on. It requires only a few seconds to turn off the power, remove a card, restore power and be ready to operate. Otherwise it is possible to magnetize a head or damage a meter.

6. It is particularly important when moving a 7/9 board from position 9 to position 7 to first turn off the power, then wait about 20 seconds before removing the board and reinstalling it.

7. Be certain to remove the power cord from the transport when moving the recorder. This is to ensure that the capstan motor lockout device will prevent the motor spud from pounding the rubber tire on the flywheel.

8. Be certain no head cables on the power boards touch the rubber tire on the flywheel at any time, either when installed or in shipment.

9. The individual electronics module power supplies are mounted behind the meter. They are accessible by pulling the meter forward. Pull the meter by the fingers applying force to the meter case below the transparent window, not above, since this may result in a cracked case.

10. Never carry an electronics assembly face downward as the power supply module may fall out, breaking the meter.

11. Do not allow reels or flanges to scrape on the painted surface of the trim plate as this will mark it badly. Scraping can be caused only by bent reels or flanges which, if they cannot be repaired should be discarded.

## TROUBLESHOOTING

Failure of the recorder to operate properly may be caused by a malfunction in the recorder, or by external causes. Before troubleshooting the recorder, verify that the power and signal connections are correct, and that all of the operational controls are properly set.

Some of the troubles most likely to be encountered are presented in table 9. However, the best troubleshooting tool is a familiarity with the equipment and a thorough understanding of its theory of operation.

Table 9. Troubleshooting

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| TRANSPORT | | |
| 1. Transport stops when leader tape passes photo cell V60, particularly after machine warms up. | Photo resistor V60 is too sensitive. | Temporary: mask cell or lamp with one or more thicknesses of white splicing tape. Permanent: change value of R71 to a lower value best determined by test. Be careful to avoid grounding any wiring on the circuit board or cell leads. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 2. Transport will not stop when tape runs out. STOP button lights when tape is not threaded. | Lamp DS8 low in light output. | Replace the lamp. Lamps blacken after long use. If type 313 is found in socket, replace with 1820, longer life bulb. |
| | Weak photo resistor V60. | Replace V60 or try raising value of R71. Try 40K. Be careful to avoid grounding any wiring on circuit board or photo cell leads. |
| 3. Capstan motor will not start when tape is threaded and the STOP light does not go out. | V60 damaged by accidental grounding. | Replace V60. |
| 4. Capstan motor will not start when tape is threaded, but STOP light goes out. | Plug P11 separated from J11. | Connect the two parts, P11 to J11. |
| | Speed change switch off normal. | Operate switch to desired speed. |
| 5. Transport coasts to stop from play mode when stop button is pressed. | Relay K7 cannot be operated during stop sequence because the reed switch is not closed. | Adjust the flag stops and/or clearance of magnets from the switch to restore operation. |
| 6. Transport coasts to stop from the FORWARD mode when the STOP button is pressed. Possible tape breakage. | Same as 5, above. | Same as 5, above. |
| 7. Transport coasts to stop from the REWIND mode when stop button is pressed. Possible tape breakage. | Same as 5, above except K6. | Same as 5, above. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 8. Tape continues in REWIND when the stop button is pressed. Restores to normal after tape runs out or POWER switch is turned off and on. | Tape motion direction sensor flag binding against forward direction stop post. | Check height of flag to be sure it clears screw head and locking nut of the post. |
| 9. Tape continues in REWIND when the stop button is pressed. Does not clear after tape runs out or POWER switch is turned off and on. | K7 hung up. Contacts 5 and 9 sticking. | Replace K7 with another relay. Interchange with K2 after burnishing contacts 5 and 9 if no other relay is available. |
| 10. Tape continues in FORWARD when STOP button is pressed. Restores to normal after tape runs out or POWER switch is turned off and on. | Same as 8, above.<br>Damaged CR33 or CR34 giving half wave power.<br>Low Line Voltage. | Same as 8, above.<br>Check diodes and replace defective unit.<br>Arrange for higher input voltage. Use auto transformer or Variac if necessary. |
| 11. Transport throws loop when starting in Play mode, generally worse near end of reel rather than beginning. | Ingoing Solenoid, capstan idler, dash pot needs adjusting. | Adjust so that dashpot piston is completely at end of cylinder when at rest position. Dashpot load should be picked up just as puck builds up sufficient tape **pressure** on capstan to cause tape to move forward. Then dashpot will allow pressure to increase as tape is accelerated to running speed. Solenoid must seat instantly when power is applied, coupling spring allows gradual buildup of puck pressure adjusted by Phillips screw in solenoid arm linkage. Dashpot adjusted by bending two tangs on fork linkage. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 12. Sluggish Solenoid operation; L1, L2. | Misalignment or in need of lubrication. | Try lubricating first with graphite or silicone. Loosening to improve alignment may change absolute position of linkages when plunger is seated necessitating their further adjustment. |
| 13. Tape lifter hangs up. | Misalignment or in need of lubrication. | Plunger must not drag too forcefully against core of solenoid. Body should be so positioned to avoid such side drag, and to provide best compromise of depth of travel to satisfy easy override yet adequate lifting power. |
| 14. Tape lifter difficult to override manually. | Plunger approaches full seated position too closely. | |
| 15. Tape lifter fails to lift tape from heads. | Plunger operating too far from seated position. | Loosen two mounting screws, lubricate plunger and shift body (holes are oversize) to achieve above requirements. |
| 16. Flutter and Wow excessive. | Numerous sources possible. Most likely are: a) Head cables dragging on flywheel tire, b) Insufficient capstan idler pressure either ingoing or outgoing, c) Defective reversing idler, d) Dirty spud on motor shaft, e) Dirty flywheel tire or f) Speed adjustment screw too loose. | Remedies are obvious; also see transport alignment for more details. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 17. Transport appears completely dead. | Blown fuse F1. | Replace with 5 amps slow blow. |
| | Intermittent operation of power switch S6. | Press a few times to observe if lights come on. |
| | C66 charged to greater than 30 volts but no 27 volt dc at collector of Q60 or at test point means Q60 is defective. | Replace Q60 after checking load resistance from collector to ground for short circuit defect. Clear defect before again applying power. |
| 18. All lamps excessively bright and short lived. | Regulator Q60 and associate circuit, Q1, R14, R15, and CR50 not functioning. | Replace Q60. Catcher diode CR51 will also require replacement if condition persisted for more than a few seconds. Check resistance of 27 volt load to be certain Q60 will not be overloaded. Transport may be operated without CR51 until replaced. |
| ELECTRONICS | | |
| 1. Meter lights but no signal. Record light will not light. Regulator transistor in power supply abnormally warm. | Short circuit on plus 28 volt bus. | Remove one plug-in board at a time and reinsert to determine if fault is in cards or module wiring. C4 on power supply unit possible shorted. System may operate without C4 until replaced. |
| 2. Playback preamp in slot 7 or 9 distorted or no output. | Bias of Q2 improper. | Collector of Q2 should be per schematic. See figure 46. Defective Q1 or Q2 causes drift. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 3. A-B transfer causes bad clicks in output (moves meter pointer). | Leaky capacitor C15 in output of record monitor amplifier on board in slot 4 or at output of preamp in slot 7 or 9. Also can be leaky input capacitor to line amplifier in slot 6 (C9). | If REPRO. LEVEL pot is noisy when turned, fault is in output of board in slot 7 or input of board 6. Extract board 7. If still noisy card 6 is at fault. If pot is not noisy when turned, trouble is probably at output of board 4 (C15). Replace faulty tantalum capacitor. |
| 4. Loss of signal in record, reproduce or monitor circuits. | Broken leads on black tantalum capacitor, likely on any board. | These capacitors are somewhat vulnerable since they project higher off the board than other components and their leads are not flexible. Replace with identical item. |
| 5. Loss of signal in record board. | Defective Field effect transistor Q2. Easily damaged by static charge from soldering iron or tool held in hand. | Replace Q2. Be very careful to avoid static charges. Ground soldering iron tip by flexible lead to ground bus of record board.<br><br>Always use insulated screwdriver or plastic blade to adjust eq. cap C18 or C19. |
| 6. Noise or intermittent operation in any area of electronics module. | Dirty contacts at base of card at plug. | Remove and reinsert card. Use ink eraser to clean contact surfaces of cards. Sockets are gold plated. They should be ok. |
| 7. High distortion | Insufficient bias. | Adjust to peak per instructions in this manual. |

Table 9. Troubleshooting (Cont'd)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 7. (Cont'd) | Magnetized head, either record or reproduce. | Degauss heads. |
| | Noise balance control misadjusted. | Adjust for minimum noise after degaussing all heads. |
| | Faulty record or playback amplifier biasing. | Check voltages per schematic. If drastically different at any point, find cause and remedy. |
| 8. Poor noise figure. | Noisy Q1 or Q2 in preamplifier. | Substitute another preamplifier to compare noise and replace transistors. |
| | Head cables badly routed, near hum fields. | Reroute for minimum noise. Keep away from power cord. This can be very important. |
| | Head cables rubbing on flywheel. | Noise arises from microphonics of cables under vibration. Must be rerouted to clear flywheel. |
| | Defective playback head requiring excessive gain. | Replace head. Try break-in tape if head appears to be smeared over by magnetic material. |
| | Lack of good system ground can produce hum or buzzing. Third wire in power cord not always effective as good ground. | Connect frame of recorder to good effective ground. |

Table 9. Troubleshooting (Concluded)

| SYMPTOM | CAUSE | CORRECTION |
|---|---|---|
| 9. Wrong output level. | Improper choice of line impedance or termination. | Set switches S105 and S106 to proper arrangement for line being fed by recorder. |
| | VU calibrated to wrong line level for specific application. | Check value of resistors R1, R2, R3, on board in slot 6. See table 10. |
| 10. Meter lights brighter than normal. | Meter light socket touching ground. | Move socket slightly, and cover with insulating tape. |
| | Defective lamp. | Replace lamp. |
| 11. Meter lights, A-B lights not lit. R13 on power supply hot. | Ground on brace to terminal 18. | Remove clamping screw and insert mica insulating washer. Replace screw. |

## FIELD SERVICE

Regular scheduled maintenance service is available from the Mincom Division service office on a contract basis. If immediate service is required, it may be obtained on an emergency basis. Every effort is made to furnish the needed repair as soon as possible. For a complete description of 3M s maintenance service plans and their costs, contact the Mincom Division service office.

## FACTORY REPAIR SERVICE

If desired, the recorder or major assemblies, may be returned to the factory (transportation prepaid) for repair. When recorder or assembly is returned:

1. Indicate the symptom of defect. State as completely as possible, both on an instrument tag and on the order form, the nature of the problem encountered. Too much information is far better than too little. If the trouble is intermittent, please be specific in describing the instrument's performance history.

2. Give special instructions. If any changes in the instrument or assembly have been made, and it is desired to retain the modified form, please indicate this specifically.

3. To facilitate expeditious repair, your Contract or Purchase Order authorizing the work should be directed to Mincom Division - 3M Company - 300 South Lewis Road - Camarillo, California 93010 - Attn: Contracts Department.

4. Pack securely and label. Proper packaging saves money. The small amount of extra care and time it takes to cushion a part or instrument properly may prevent costly damage while in transit. Make certain that the address is both legible and complete; failure to do so often results in needless delay. Address all shipments and correspondence to:

   Mincom Division
   3M Company
   300 South Lewis Road
   Camarillo, California 93010

   Attn: Receiving Inspection

5. Show return address on repair correspondence. Please clearly indicate the exact address the equipment should be returned to after repair is completed. Terms are net 30 days - f. o. b., Camarillo, California.

# PRINCIPLES OF OPERATION

## INTRODUCTION

The 3M Brand Professional Audio Tape Recorder is an advanced audio recording instrument that incorporates the best techniques available at the present state of the art. A tape recorder consists basically of a tape transport (deck) and record and reproduce (play) electronics. The signal to be recorded is amplified and applied to a magnetic record head, which impresses a magnetic pattern in the oxide coating of the magnetic recording tape in accordance with the variation of the input signal. During reproduction (play) the variations in magnetic flux that were impressed on the tape during recording, are sensed by a reproduce head, amplified, and applied to the recorder output.

In order to record and reproduce with a minimum of distortion, a high-frequency bias is mixed with the input signal at the record head so that recording takes place in the portion of the magnetization curve that is essentially linear. The signal recovered by the reproduce head must also be equalized by circuits that compensate for the response characteristics of the reproduce head at low and high frequencies.

The high-frequency signal that is used for bias is also used to erase signals that may have previously been recorded on the tape. The erase signal is applied to a separate erase head, which is similar to the record head but applies the high-frequency signal at a much higher level. The signal applied to the erase head drives the magnetic material of the tape to complete magnetic saturation to obliterate any signal, or noise that may have been previously recorded on the tape.

The patented Isoloop tape drive maintains differential tension within the loop of tape passing over the heads and ensures that the tape remains in close contact with the heads during tape travel. This ensures that the magnetic flux impressed by the record head penetrates the oxide material uniformly and eliminates variations in amplitude that can result if the close head-to-tape contact is not maintained. Similar amplitude variations can take place if the tape is not maintained in close contact with the play head.

### Tape Drive Components (See Figure 30)

Components of the tape drive system consist of a capstan drive motor, two reel drive motors, and control relays that determine the mode of operation. When in play and record modes, the tape is moved through the Isoloop by the capstan. The reel drive motors maintain constant tension on the tape as it enters and leaves the loop. When in fast-forward or rewind, tension is released within the Isoloop and the reel drive motors move the tape through the loop independently of the

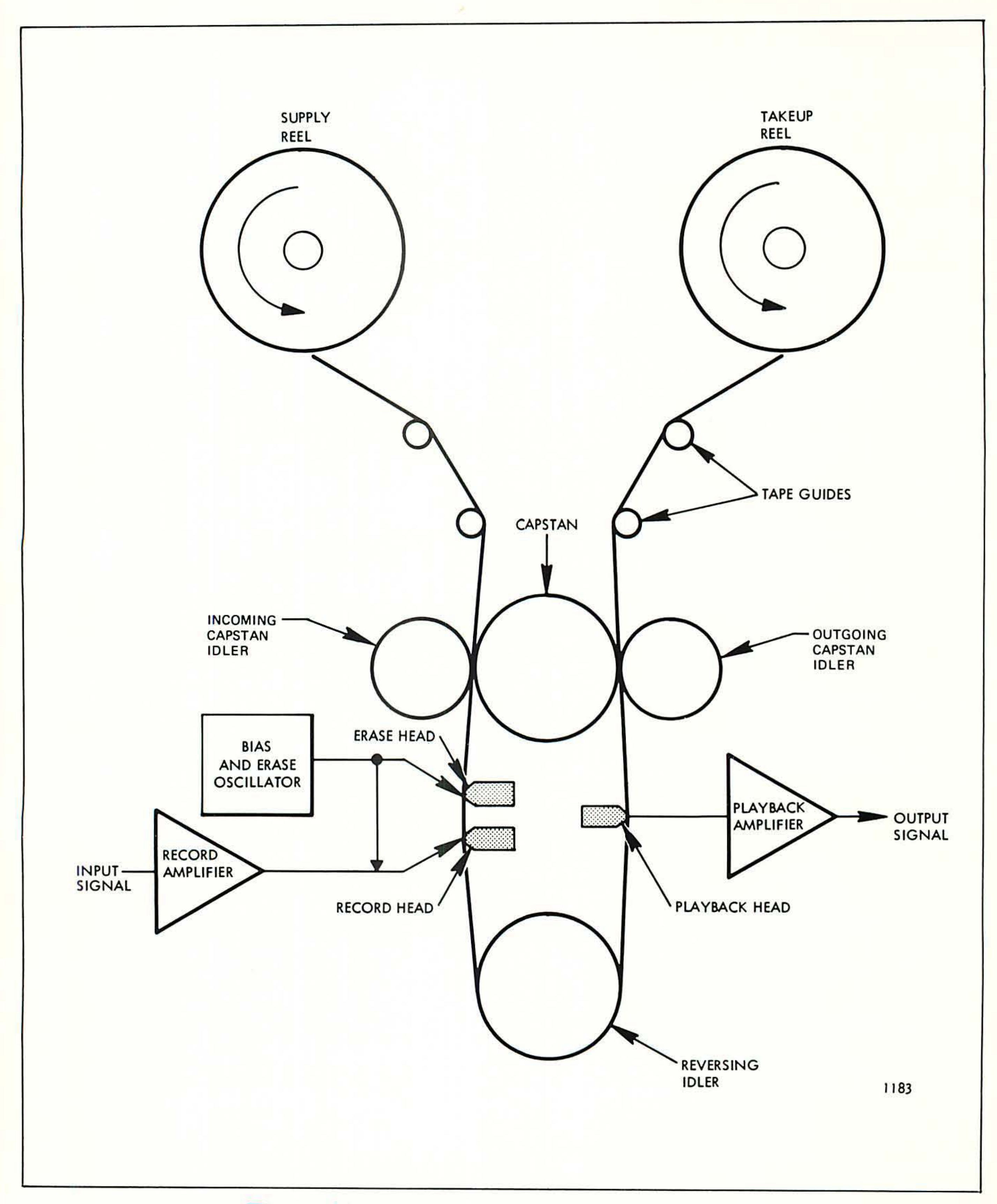



Figure 30. Tape Recorder, Block Diagram

capstan. Before entering and after leaving the Isoloop, the tape passes over stationary guides to ensure that is properly aligned with the magnetic heads.

When the transport is in the play and record modes, solenoids press the capstan idlers against the tape, clamping it to the capstan to prevent it from slipping. The tape is moved past the income idler and capstan, past the erase and record heads, and around the reversing idler. From the reversing idler, it passes the play head, and the outgoing idler and capstan. During fast-forward and rewind, solenoid-actuated tape lifters hold the tape away from the tape so that signals on the tape will not be played back, which would cause an annoying squeal. The tape lifters are inactive in play, record, and stop modes.

The play head is enclosed in a magnetic shield to avoid pickup of noise from surrounding equipment and bias-frequency energy radiated by the erase and record heads. A solenoid-actuated cover is positioned over the tape as it passes the play head and serves to complete the shielding of the head. During fast-forward, rewind, and stop, the hinged cover is moved away from the head to allow the tape to be lifted by the tape lifters and allow easy threading of the tape. The cover is closed during play and record.

## TAPE TRANSPORT CIRCUIT DESCRIPTIONS

The following circuit descriptions relate to figure 31 which must be used to follow the discussions. In the schematic, connector terminals are shown as small rectangles with the connector and terminal numbers inserted.

### Power Circuits

A standard, three-wire power cable is provided, which must be connected at J1. The third, or ground, lead must be connected to a good earth ground; otherwise the recorder will not meet dynamic range specifications in regards to hum, harmonic buzz, or radio-frequency fields. The power is normally 60 cycles, 105 to 125 volts, but 50 cycle models for the same voltage range are available and entail only a change of capstan motor characteristics. The schematic otherwise remains unchanged. For 220 volt operation an external line transformer must be used.

The POWER switch, S6, when operated, closes both sides of the input line activating a number of circuits. These are as follows:

1. Bridge rectifier CR46 through CR49 charges capacitor C65 through R60 approximately 165 volts in the absence of a load. This voltage is applied through J7-2 and J9-1 to the fields of the takeup and rewind motors. Field returns are through J7-1, and J9-2 through J6-4, and K1 contacts 6 and 10. Relay K1 operates as soon as power is turned on unless the transport has been previously threaded with tape.

2. Power is supplied from terminals J4-11 and J4-12 to the various electronics modules through an interconnecting cable.

3. Power is supplied to step-down transformer T60 from terminals TB3-2 and TB3-1. The low-voltage secondary feeds terminals J5-2 and J5-3. A full-wave bridge on the board, consisting of CR37 and through CR40 supplies charging current through terminals J5-5 and J5-1 to C66 and regulator transistor Q60. Zener Diode CR50 is supplied from R14 and establishes a voltage reference of 27 volts, applied through R15 to the base of amplifier transistor Q1. The collector of Q1 is directly coupled to the base of Q60 and the output collector potential of Q60 establishes the emitter voltage of Q1. The two transistors thus act to regulate the bus potential (approximately 26.5 volts). When power is applied the bus potential lights POWER indicator DS6, and the tape sensing lamp DS8. If fail-safe brakes are furnished, L6 operates to release them. As the solenoid approaches the end of its stroke, S15 is opened to reduce current in L6 by insertion of R73. Without tape on the machine, light from DS8 falls on photo sensor V60. The base of Q61 is thereby held near ground potential. The collector at Q61 is then at a relatively high potential causing Q62 to increase conduction. Current flows through Q62 to relay K1 through J6-7 to operate relay K1. Through K1 contacts 11 and 7, voltage is applied through J6-9 to J3-N, to light an indicator lamp on the Remote Control; if used, to show that the machine is on but inoperative due to the absence of threaded tape. The playback head shield cover door is caused to open through CR-25, J6-14, and TB1-1 with a return path through TB1-2. Also at this time, K1 contacts 12 and 4, and 11 and 3 are open and the 27 volt bus can perform no further function. Because of this, the machine may not be put into any mode of operation until tape is threaded on the machine.

4. A path is prepared through J5-F to J5-D and P11-2J to furnish power to the capstan motor, but this is kept open by K1 contacts 1 and 9 when tape is not threaded. The capstan motor is energized through J8-7 and S8 to either J3-8 or J8-4. The quadrature winding of the motor is supplied through C64 and R63 and through S8 to either J8-5 or J8-6. Motor return leads, depending on the speed selected by S8, are through J8-1 and J8-2, or J8-1 and J8-3 back to switch S6 through P11-J1. When power is supplied to the capstan motor it is also supplied to bridge rectifier CR42 through CR45. The dc output of the bridge is applied through J5-J, R68, and TB2-3 to a solenoid, which pulls the motor pulley physically into contact with the capstan flywheel tire. Return path of the solenoid is through TB2-2 and J5-7. Filter capacitor C68 prevents induction of hum from the solenoid into the playback heads.

5. Power is applied to J3-c and J3-d for application at the remote control position, if required.

6. The fan is normally connected across TB1-4 and TB1-6 where it is operated only when the capstan motor is running. By removing the fan lead on TB1-4 and connecting it to TB1-5, the fan will run whenever the power switch is on.

## Threaded Tape Condition

When a reel of tape is placed on the supply hub, the free end is passed through the incoming side of the Isoloop, past the capstan and record head, and around the reversing idler, then between the outgoing side of the capstan and its idler. When the tape is dropped into position at this point, light is cut off from V60 causing relay K1 to release. CR-1 is a surge protective diode.

When K1 contacts 11 and 7 open, the head shield cover is closed because the door solenoid is released and the remote TAPE RUNOUT lamp goes out.

Closure of K1 contacts 11 and 3, and 12 and 4 applies bus potential through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K5 contacts 12 and 4 through J5-14 to light STOP lamp DS3; and a path through CR13 and R5 charges C3, and operates K4. Several other paths are likewise made ready. Opening of K1 contacts 10 and 6 inserts R9 in the return path of the reel motor fields and the voltage developed across this resistor is applied through K5 contacts 1 and 9, K6 contacts 1 and 9, K7 contacts 1 and 9 through J6-A to the armature of the rewind motor. A similar path applies the same voltage to the takeup motor through K5 contacts 2 and 10, K6 contacts 2 and 10, K7 contacts 2 and 10, and J6-2. The torque so generated is very small; sufficient to remove slack from threaded tape but not enough to cause motion of the tape from a large-diameter reel to a smaller one. When the end of the tape is threaded into the takeup reel, the transport is ready to be put into motion from its standby condition.

## From Standstill to Play

Bus potential exists on switch S5 through J6-D, J2-9, and J2-10. Closure of the PLAY pushbutton applies this through J6-18 and CR4 to operate relay K3 momentarily. Through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12, K5 is caused to operate. Release of the PLAY pushbutton releases K3 but K5 remains locked up through K5 contacts 8 and 12, K8 contacts 3 and 11, etc. PLAY lamp DS5 remains lit through J6-17 since it is in parallel with the coil of K5. This same supply immediately operates the ingoing capstan idler solenoid through TB2-1, clamping the tape gently, under control of a dashpot, to the capstan. The break at K5 contacts 12 and 4 removes bus voltage from C3 and the coil of K4 so that after approximately 0.5 second, K4 releases. Closure of K4 contacts 11 and 3 applies bus power to J6-12 and TB2-3 and operates the outgoing capstan idler solenoid. This occurs after the tape has accelerated to

running speed under control of the ingoing solenoid. In one-inch capstan machines, C3 is rated at 500µF to delay the operation of the outgoing solenoid an additional 0.4 second.

When K5 operates, the transfer of K5 contacts 2 and 10, to 6 and 10, applies full dc power through K4 contacts 6 and 10, K5 contacts 6 and 10, K6 contacts 2 and 10, and K7 contacts 2 and 10 to the takeup motor armature and a reasonably high hold-back torque to the supply motor through K4 contacts 6 and 10, R8, K5 contacts 5 and 9, K6 contacts 1 and 9, and K7 contacts 1 and 9. After the tape is up to speed and K4 released, the break at K4 contacts 6 and 10 inserts resistors R61 and R62 in the armature paths to establish proper winding and holdback torques since acceleration conditions are replaced by constant-velocity operation.

### From Play to Stop

Directly beneath the takeup reel hub on the takeup motor shaft is mounted a ball bearing. The outer race of this bearing is not rigidly mounted but is centered in a light-weight vane. The vane would rotate with the takeup motor shaft but is prevented from doing so by two posts. The vane rests against one post when the motor turns in one direction and shifts through an angle of about 15 degrees to rest against the other post when the motor turns in the other direction. The vane carries a small magnet, which causes operation of reed switch S13 when the motor runs in the forward direction. Switch S13 is released and S14 is caused to close when the motor turns in the reverse direction.

With the machine in the play mode, if the STOP pushbutton is pressed, the following takes place: Bus voltage is applied from K3 contacts 10 and 2 through J6-11, J2-12, J2-11, and the closed contacts of S3, through J6-8 to operate relay K8. Bus power from J6-D is applied through S13, which is closed in the forward direction, through J5-18, K8 contacts 6 and 10 to operate K7. Relay K7 closes a holding path for relay K8 through K7 contacts 12 and 8, K8 contacts 8 and 12, to K8 terminal 14, so that K5 and K6 both remain operated after pressure is removed from S3. The REWIND lamp is lit through K7 contacts 11 and 7. The break at K8 contacts 3 and 11 opens the holding circuit for K5 and it releases, extinguishing the PLAY lamp and dropping out the capstan idler solenoids so as to unclamp the tape from the capstan. Operation of K7 provides full torque power through K7 contacts 5 and 9 and through J6-A to the rewind motor, while the break at K7 contacts 2 and 10 removes all takeup motor torque, bringing the tape to standstill and attempting to start it in the reverse direction. Motion of the tape in the opposite direction, however, causes the vane in the sense switch assembly to leave its former position against the forward stop and swing toward the reverse stop. When the magnet moves away from S13, this switch opens, dropping out K7. This applies a light holding torque to the tape. When K7 releases, it releases K8 by opening K7 contacts 7 and 11. Relay K4 is held closed through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, K5 contacts 12 and 4, CR13 and R5. It was previously operated through K7 contacts 12 and 8, CR14 and R5. With the exception of K4, all relays are de-energized and STOP lamp DS3 is lit.

### From Stop to Rewind

With the machine in standby, pressing REWIND pushbutton S2 causes bus voltage to be applied through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, S2, J5-R, and K8 contacts 2 and 10 operate K7. The relay applies rewind torque through K7 contacts 5 and 9 as outlined above, and K7 locks up to the power bus through K7 contacts 11 and 7, and K8 contacts 2 and 10. The tape accelerates in the rewind direction with full power on the armature of the rewind motor. Since this is a dc shunt motor, it would reach a certain terminal velocity at which time tape would be loosely wound except for the following feature. As the tape comes up to speed in rewind, the armature of the takeup motor is open circuited because of the break at K7 contacts 2 and 10. It operates as a dc generator without load until a definite terminal voltage is reached, the voltage rising as the speed increases. Zener diode CR53 will not pass current until the potential across it reaches 75 volts. Therefore, when the generated voltage reaches this level, current flows through J9-4, J6-S, CR32, CR53, J6-2 and J9-3 to act as a load and effective brake on the takeup motor, limiting the maximum speed at which it will supply tape and thereby providing a controlled tension in the reel being filled. Closure of K7 contacts 12 and 8 provides a path through CR24, J6-14, and TB1 to open the head shield door and through J6-15 to operate the tape lifters.

### From Rewind to Stop (Tape Moving in the Rewind Direction)

Pressing STOP switch S3 operates relay K8 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, and J6-8. Since tape is moving in the rewind direction, the sense switch vane has caused S13 to open and S14 to close. Therefore, K6 is caused to operate through J6-D, S14, and K8 contacts 5 and 9. Relay K8 is locked up through K6 contacts 11 and 7, K8 contacts 8 and 12, and K6 is held up by S14. Relay K7, however, is released by the break at K8 contacts 10 and 2 and the fact that S13 is open. The power that was supplied to the rewind motor through K7 contacts 5 and 9 is removed by its release and transferred through operation of K6 through K6 contacts 6 and 10 to the takeup motor, which now operates to bring the tape to standstill and attempts to reverse it to the forward direction.

As soon as the sense switch vane moves away from S14 toward S13, S14 opens releasing K6 and placing all circuits in the standby condition. During the stopping interval, the REWIND lamp goes out and the FORWARD lamp is lit from release of K7 and operation of K6. In standby, the tape lifter solenoid is released and K-8 is released by the break at K-6 contact 7 and 11. The head cover door remains operated through S-12, J6-M and CR-26 unless manually overriden to break S-12. Relay K4 remains energized throughout the above action, either through K7 contacts 12 and 8, CR14; or through K6 contacts 11 and 7, CR14; or through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3 and K5 contacts 12 and 4 and CR13.

### From Rewind to Stop (Tape Moving in Forward Direction)

It is possible while shuttling the tape at high speed to have the tape moving in the forward direction but to have the controls in the rewind mode. If the STOP pushbutton is pressed at this time, K8 is energized in the manner described above; however, K7 is not released in favor of K6 because the sense switch vane is in position to cause S13 to be closed and S14 open. Thus K7 remains energized and the tape comes to standstill and attempts to reverse at which time the sense switch opens S13, releasing K7 and putting the machine in standby. At this time the tape lifters are released and K8 is released by the break at K7 contacts 8 and 12. The door solenoid remains energized through S12 unless overridden manually to break S12.

### From Stop to Forward

With the machine in standby, pressing the FORWARD pushbutton causes bus voltage to be applied through K3 contacts 10 and 2, J6-11, J2-12, S3, S2, S4, J5-S, CR17 and K8 contacts 1 and 9 to operate K6. Relay K6 applies full torque to the takeup motor through K6 contacts 6 and 10, K7 contacts 2 and 10, J6-2, and J9-3, causing tape to accelerate in the forward direction. Relay K6 locks up to the power bus through K8 contacts 9 and 1, K6 contacts 8 and 12, and K7 contacts 3 and 11. Motor speed is limited by the action of Zener diode CR52 as described before.

Closure of K6 contacts to 11 and 7 provides a path through CR24 to open the head shield door and through J6-15 to operate the tape lifters.

### From Forward to Stop (Tape Moving in Forward Direction)

Pressing STOP switch S3 operates relay K8 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3 and J6-8. Since tape is moving in the forward direction, the sense switch has caused S13 to be closed and S14 to be open. Thus, K7 is operated through J6-D, S13, J5-18, and K8 contacts 6 and 10. Relay K8 is locked up through K7 contacts 12 and 8, and K8 contacts 8 and 12. Relay K6, however, is released by the break at K8 contacts 9 and 1. The power that was supplied to the takeup motor through K6 contacts 6 and 10 is removed by its release and transferred through closure of K7 contacts 5 and 9 to the rewind motor, which now operates to bring the tape to standstill and attempts to reverse it to the rewind direction. As soon as the sense switch moves by reversal of tape motion, it releases S13, releasing K7 and placing all circuits in standby. During the stopping interval, the FORWARD lamp goes out and the REWIND lamp lights because of the release of K6 and operation of K7. In standby, the tape lifter solenoid is released. K8 is released by K7 contact 8 and 12. The door solenoid remains energized through S12 unless manually overridden to break S12.

**From Forward to Stop (Tape Moving in Rewind Direction)**

It is possible, while shuttling tape at high speed, to have the tape moving in the rewind direction but to have the controls in the forward mode. If the STOP button is pressed at this time, K8 pulls in in the manner described above. However, K6 is not released in favor of K7 because S14 is held closed by the sense switch vane while S13 is open. Thus, K6 remains operated and the tape comes to standstill and attempts to reverse, at which time the sense switch opens S14, releasing K4 and putting the mechanism in standby. At this time the lifter solenoid is released, and K8 is released by the break at K6 contact 7 and 11. The Door solenoid remains operated through S12 unless manually overridden to break S12.

**From Forward to Rewind**

Considering the tape to be in the forward mode regardless of its actual direction, relay K6 is energized. Pressing the REWIND pushbutton closes a circuit to operate K7 through K3 contacts 10 and 2, J6-11, .S3, S2, J5-R, K8 contacts 2 and 10 to K7-14 through K7-13, CR19 and R6 to ground. Relay K7 operates, opening the holding path for K6 at K7 contacts 3 and 11, which releases, further breaking its holding circuit at K6 contacts 8 and 12. Torque power to the reel motors is therefore reversed. Relay K7 locks up through K8 contacts 10 and 2, and K7 contacts 7 and 11.

**From Rewind to Forward**

Considering the tape to be in the rewind mode regardless of its actual direction, relay K7 is energized. Pressing the FORWARD pushbutton closes a circuit to operate K6 through K3 contacts 10 and 2, J6-11, J2-12, J2-11, S3, S2, S4, J5-S, CR17, and K8 contacts 1 and 9 to K6-14. Because J5-S applies bus potential to CR20 as well as to CR17, the coil of K7 is effectively shorted, since the total voltage appears across R6. This releases K7, K6 remains operated over the path K7 contacts 11 and 3, K6 contacts 12 and 8, and K8 contacts 1 and 9. Torque to the reel motors is therefore reversed.

**From Rewind to Play**

In the rewind mode, regardless of actual direction of tape motion, relay K7 and K4 is energized. Pressing PLAY pushbutton S5 causes bus power to flow through J6-D, J2-9, J2-10, S5, J6-18, and CR4 to operate K3. A holding path is established through K7 contacts 12 and 8, K3 contacts 11 and 7, R1, CR8 and CR7 so that K3 will not release when S5 is released. Relay K3 contacts 10 and 2 open the paths to S3, S2 and S4 pushbuttons to render them inactive at this time. The potential from K7 contacts 12 and 8 through K3 contacts 11 and 7, and through R1 also feeds through CR9 to terminal 14 of K8 causing it to operate. Because this action opens the holding path of K7 through K8 contacts 10 and 2, and K7 contacts 7 and 11, an unstable condition could arise, but this is prevented by the charge in C12, which continues to hold K8 until the transfer of K7 is completed if need be. Whether K7

continues to hold or to transfer to K6 is determined by the direction the tape is moving as outlined above. In any event, operation of K8 functions to bring the tape to standby condition. When K6 or K7 is released by the sense switch as the tape reaches standstill and attempts to reverse, the break at K6 contacts 7 and 11 or K7 contacts 8 and 12 releases K8. Normally, the machine would now remain in standby, but at this time K3 is still operated even though its supply path through K3 contacts 7 and 11 is open. This is because it is held by the charge in C1 for sufficient time to perform an additional function. When K8 releases, bus power is supplied through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12 to operate K5. The functions from here on are as described under "From Standstill to Play."

### From Forward to Play

In the fast-forward mode, regardless of actual direction of tape motion, relay K6 and K4 is energized. Pressing PLAY pushbutton S5 causes bus power to flow through J6-D, J2-9, J2-10, S5, J6-18, and CR4 to operate K3. A holding path is established for K3 through K6 contacts 11 and 7, K3 contacts 11 and 7, R1, CR8, and CR7 so that K3 will not release when S5 is released. Relay K3 opens the paths to S3, S2, and S4 pushbuttons to render them inactive at this time. The potential from K7 contacts 12 and 8 through K3 contacts 11 and 7 and R1 also feeds through CR9 to terminal 14 of K8 causing it to operate. Because this action opens the holding path for K6 through K8 contacts 9 and 1 and K6 contacts 8 and 12, an unstable condition could arise but is prevented by the charge in C12, which continues to hold K8 until the transfer of K6 is completed, if need be. Whether K6 continues to hold or to transfer to K7 is determined by the direction of tape movement. In any event, operation of K8 functions to bring the machine to a standby condition. When K6 or K7 is released by the sense switch as the tape reaches standstill and attempts to reverse direction, the break at K6 contacts 7 and 11, or K7 contacts 8 and 12, releases K8. Normally, the machine would now remain in standby but at this time K3 is still energized even though its supply path through K3 contacts 7 and 11 is open. This is because it is held by the charge in C1 for sufficient time to perform an additional function. When K8 releases, bus power is supplied through K7 contacts 11 and 3, K6 contacts 12 and 4, K8 contacts 11 and 3, and K3 contacts 8 and 12 to energize K5.

### Tape Runout

When the tape runs out from any mode of operation, the light from lamp DS8 falls upon photo diode V60, causing K1 to energize. This action opens the bus supply to all other relays. All power is therefore removed from the armatures of the take-up and rewind motors. A short circuit is applied to the armature of each motor. One such circuit is through J9-4, J6-S, K1 contacts 10 and 6, J6-4, J2-1, J2-2, J5-P, K5 contacts 2 and 10, K6 contacts 2 and 10, K7 contacts 2 and 10, J6-2 and J9-3. The other circuit is through J7-4, J6-S, K1 contacts 10 and 6, J6-4, J2-1, J2-3, J5-V, K5 contacts 1 and 9, K6 contacts 1 and 9, K7 contacts 1 and 9, J6-A, and J7-3. Since the fields are fully excited, this system acts to brake the motors to a standstill since they operate as dc generators operating into a short circuit.

## Record Mode Operation

The record mode can be selected only when the PLAY lamp is lit, indicating that the machine is running at normal speed. It is then necessary to press both the RECORD and RUN pushbuttons simultaneously. Bus power is applied through J6-D, J2-9, J2-10, S5, S1, J5-13, and K3 contacts 7 and 11 to operate K2, which then locks up to the holding path for K5. This path is K5 contacts 8 and 12, and K2 contacts 8 and 12. The path established to hold K2 then lights DS1 through J6-3 and supplies positive bus voltage to the electronics power cable through connector J4-9. Relay K2 contacts 11 and 7 also supply ground potential to the same connector through J6-T to J4-10. The positive potential is also applied through R16 and CR29 to the bias oscillator. Capacitor C7 is provided both for decoupling and for delayed decay after power is removed. Transistors Q2 and Q3 operate as a low power, push-pull oscillator to provide a high-frequency signal to terminals J6-U and J6-V. The electronics assembly cable conducts high-frequency bias to all bias boards in the electronics through J4-1 and J4-2. The oscillator is tuned to 120 kHz by capacitor C11.

## Speed Change Switch

Speed change switch S selects windings of the capstan motor to provide either of two speeds. These are related by the ratio 2:1 and therefore can be provided for tape speeds of 3-3/4 and 7-1/2 ips, 7-1/2 and 15 ips, and 15 and 30 ips, etc. Dc bus potential is supplied to either J4-6 or J4-7 in the electronics power cable, depending on the motor speed, in order to control equalizer-select relays in the electronics circuit boards.

## Reel Size Switch

Reel size switch S7 provides for adjustment of torque in fast forward or in rewind when one spindle carries the normal large reel and the other carries a light-weight reel. If both reels are the same size, the switch is left in the center BALANCE position. If the large reel is on the tape takeup side, the switch is moved toward the right, or toward the large reel (in the direction of the arrowhead on the panel). If the large reel is on the left, or supply side, the switch is moved to the left. In the center position, S7 connects J5-N to J6-1 and J5-15. If K6 is energized, putting the machine into fast forward, heavy dc current flows through the takeup motor, returning to the negative supply through R60. Thus J5-L is a few volts more negative than J6-S. This negative potential is applied through CR30, S7, and R11 to the rewind motor, causing it to develop small torque in the same direction the takeup motor tends to turn. This aids acceleration. Similarly, in rewind, R10 supplies reverse torque to the takeup motor, assisting in getting the tape up to high speed. When a small reel is on one side, however, this assistance is not desirable since it may tend to unwind tape faster than the other

reel can spool it. Thus S7 provides for breaking the negative line through R10 or R11 as needed. This feature is only applicable to 1/2 and 1-inch machines. The switch, although provided, is inactive in 1/4-inch machines.

### TORQUE CONTROL RELAY (¼-inch machines only)

Due to the light weight and inertia of the small plastic reels commonly used on 1/4-inch machines, there is a tendency for a loop to form in the tape between the outgoing tape guide and the reel receiving the tape if negative torque is applied through R10 or R11 before the tape has come to rest and started to move in the opposite direction. To prevent reverse torque from being applied until the tape has begun to travel in the direction of the selected mode, K13 is installed in the socket provided on the transport near the rewind motor. Reel size switch S7 is not connected as stated above.

Consider the tape to be in motion in the fast forward direction with K6 energized. Pressing the REWIND pushbutton energizes K7 and releases K6. Drive torque is immediately transferred from the take-up motor to the rewind motor. Due to the momentum of the reels traveling in the forward direction, the tape does not come to an immediate stop but continues to travel in the forward direction until this momentum is overcome by the dynamic braking action caused by the reverse torque applied to the rewind motor, which is attempting to pull the tape in the opposite direction. During this slow down period, directional sense switch S14 is open, which maintains K13 in the deenergized position. Therefore, the circuit path to the take-up motor armature is broken at K13 contacts 5 and 9, causing the motor to coast to a stop under the braking action of the rewind motor only. As the tape motion comes to rest and starts to reverse its direction, S14 closes. Buss power is applied to K13, providing negative torque power through contacts 5 and 9, R10, etc., to the take-up motor and causing it to turn in the same direction as the rewind motor. This action reduces the drag on the rewind motor and aids acceleration as described under "Reel Size Switch." Thus, K13, in conjunction with directional sensing switch S14, prevents negative torque power from being applied to the appropriate reel motor until the tape has come to rest and starts to accelerate in the opposite direction.

### Monitor Switching

Two pushbuttons on the transport, S10 and S11, are arranged to transfer the output line amplifier and VU meter of each electronics circuit board from the incoming signal source to the playback and vice versa. Pressing A switch S10 applies bus voltage from J6-D through J2-9, J2-10, and S10 to J4-5, which is in the electronics power connector, causing operation of transfer relays in each module. Similarly B switch S11 applies bus potential to terminal J4-4 to cause reverse operation of the transfer relays. These switches are momentary-contact types and are not lighted.

### Runout Switch

The runout switch is provided on all models of the machine. The sensing circuits associated with the switch are furnished on all series A transports but are furnished on B transports only on special order. When connected, it provides for automatic stopping of the tape before runout, automatic rewind at the end of the tape, and automatic starting of a second machine under either of these conditions. The circuit is actuated when light from an exciter lamp falls upon a photo sensor through a "window" in the tape.

### Fail-Safe Brakes

For certain applications, it is desirable to include self-energizing mechanical brakes on the transport to prevent a tape spill if power fails. The fail-safe brakes, which are provided on special order, are released whenever power is on and are applied when the machine is turned off or power interrupted. Solenoid L6 is energized directly from the low-voltage dc supply. When it operates to lift the brakes, microswitch S15 is opened, inserting 150-ohm resistor R73 into its path to prevent overheating of the solenoid winding.

## SIGNAL ELECTRONICS FUNCTIONS

Signal electronics consist of record amplifiers, which raise the input signal to a level required by the record (heads), a bias and erase frequency power supply, and equalizer circuits and amplifiers to reproduce the signal recovered by the playback heads. Each complete electronics assembly includes a power supply, controls, and a volume indicator (VU meter).

Signal processing is either in conformance to NAB standards or Dynatrack operation. In Dynatrack recording and playback, two tracks are used. One track records at the standard NAB level, this is the H track; and the other track records the identical information, but records high frequency signals at a higher level (more recording gain), employing a pre-emphasis curve rising 15 db from 400 cycles to 15,000 cycles. When the tape is reproduced, the output is switched between the L and H tracks depending upon the amplitude of the recorded signal. When the recorded signal is at a low level the L track will provide the signal output and, of course, de-emphasis of the previously pre-emphasized signal. When the amplitude of the recorded signal increase to where the distortion of the L track approaches 1 percent, the output will switch to the H track. Switch over from the L track to the H track, and vice versa, is automatic during the reproduce precess. The switchover is fast enough so that no discontinuity is apparent to the listener.

The overdub feature allows a record head to be used as a playback head so that a second track can be recorded in synchronism with a pre-recorded signal. This feature avoids the time lag that would occur if the playback head were to be used for monitoring during overdub operation.

## NAB ELECTRONICS

One electronics module is employed for each compatible NAB equalized track. Thus, in a 1/2-inch machine having standard four track heads four channels of NAB equalized signals may be recorded. In this case four electronic assemblies are required, equipped with the proper board for NAB service. If it is desired to employ the Dynatrack system, two tape tracks are required to each channel. Therefore, the four-track configuration permits a two channel Dynatrack system and only two electronic assemblies are employed, equipped with the proper cards for Dynatrack operation. Electronic Assemblies are readily converted from Dynatrack to NAB and vice versa by merely changing boards and head cable connectors at the rear of the assemblies. The following describes the operation of a complete electronics assembly arranged for NAB service.

The individual plug-in boards will be fully described after an outline of their function in relation to their service in the overall operation. Refer to figures 37 and 38 during the following discussion. The rectangular dashed areas represent **plug-in** units. The numbers in ovals represent connector pin numbers.

### NAB Recording

The signal to be recorded is applied through connector J101 to the primary of transformer T1, which reflects an impedance of 20,000 ohms to the signal source. Input is through a two-wire shielded cable with the signal lines ungrounded. The secondary of T1 is connected across RECORD LEVEL control R100, which establishes the level of the signal applied to the record amplifier. This amplifier provides pre-emphasis, equalization, and linearization to the signal, and sufficient gain to drive the record head. A relay on the board selects equalization networks for the two tape speeds used. Linearization is selectable by means of a switch on the circuit board and is adjustable. The degree of linearization required depends on the signal level, and corrects for distortion that occurs as the signal level approaches the saturation level of the tape.

A pilot tone, used for tape-speed control, may be introduced by way of connector J111-1, and terminal 16 of the H and NAB Record board, to be mixed with the normal input signal. The pilot tone may be either supersonic or subsonic.

A separate amplifier is included on the H and NAB Record Board to bring the input signal to sufficient level to apply to the monitoring circuits so that this signal may be listened to and observed on the VU meter. A variable control RECORD MON. CAL. enables the meter to be adjusted so that, without the linearizer in service, 3% total harmonic distortion on playback results at 6 db above zero VU.

The main signal from the record board appears on the record relay K101 at terminal 9. It is normally grounded through K101 contact 9 and 1 but when K101 is operated the signal is applied through K101 contact 9 and 5 to the H Bias and Erase Board (1) in slot 1. Whenever the RECORD button on the transport is activated, an oscillator in the transport is energized and provides 120kHz from J110 terminal 1 and 2 to terminals 14 and 15 of this board and all other identical boards in the other electronic assemblies of a multi-channel recorder. A power amplifier feeds the 120 kHz bias signal through a variable resistor BIAS AMP to provide the proper magnitude of bias to the record head through terminal 1. The audio signal from terminal 22 is also passed to terminal 1 through a bias trap circuit which has no effect on the audio signal, but prevents drainage of bias power back through the record amplifier board. A noise balance control is provided which injects an adjustable DC component into the record head to correct for external fixed magnetic fields in the vicinity of the record head gap.

In order to monitor the bias and audio signal mixture by means of an oscilloscope or vtvm, the record head is returned to terminal 2 which is removed from ground by 10 ohms. Monitoring is at the TP BIAS test point and a variable control permits the VU meter, when connected to terminal 3, (set to BIAS) to be calibrated to a fixed number on its scale (-5 VU for example).

A second power amplifier, also driven by the 120 kHz signal, applies its output through terminal 21 to terminal 20 of the NAB Erase Coupler Board (3N) in slot 3. The signal passes through an adjustable capacitance to terminal 11, and from there to the erase head. There is a feedback path through board 3N terminal 19, and board 1 terminal 19, to control the amount of drive of the erase amplifier. The amount of feedback is controlled by the feedback resistor. The amplitude of the erase current may be monitored at the TP. ERASE test point on board 3N. The VU meter may be calibrated by variable resistor ERASE MON. CAL. which is feeding via terminal 22 to the VU monitor. Typical calibration provides 0 VU when erase current is adequate.

In addition to transferring the record amplifier output from ground to the bias amplifier board, relay K101 also causes indicator lamp DS103 to light through contacts 12 and 8 and applies +28 volts to energize the bias and erase amplifiers at terminal 12 on the H Bias and Erase board (1). Another pair of contacts is used during Dynatrack operation and is discussed under that heading. Inductive surge from the coil of K101 is suppressed by diode CR101.

**NAB Reproduction**

Signals recorded by the H and NAB record circuits described above are reproduced from the corresponding playback head and applied to the H and NAB preamplifier board in slot 7. The preamplifier board contains high-frequency and low-frequency amplitude equalizers for two tape speeds. The proper equalizers are selected by a relay on the board, which is energized by a voltage introduced through terminal 20. High-frequency and low-frequency equalizer networks are provided for each tape speed. Phase correction networks are selected by another relay with a separate network for each speed. This relay is energized by a voltage introduced through terminal 19. The phase correction networks are not adjustable.

At the pilot connector J111 all signals may be fed out on terminal 2 with return on 5, in order that the pilot, if any, may be extracted free from gain variations occasioned by adjustment of the GAIN CAL. potentiometer which feeds the main audio signal out on terminal 22.

A jumper loop is provided on the terminals 17 and 16 of slot 8 when machines are furnished from the factory with only NAB boards. No card is then provided for slot 8 and the signal bypasses the slot directly to the REC. SELECT switch 103. Since it is necessary to provide a preamplifier and electronic switch card in slot 8 when the Dynatrack system is employed, this loop must be clipped open and later if converted again to NAB operation an NAB conversion card (8N) must be inserted in slot 8 when the Dynatrack card is removed. This card is blank except for a jumper loop between terminals 17 and 16, to again close the loop previously clipped. It is furnished with the Dynatrack conversion kit.

When the REC. SELECT switch is in the RDY position, the record head is connected to the output of the H bias and erase board; +28 volts is supplied from the power and meter assembly in slot 5 through terminal 12 to this switch, to terminal 13 of the record relay so that it may be operated by grounding its terminal 14 through diode CR102; and to terminal 10 of J110 at the tape transport.

The signal from terminal 16 of slot 8 is routed through the REC. SELECT switch to the REPRO. LEVEL control and an attenuator comprising R104 and R105. With the METER switch in the CAL. position, the signal from the attenuator is routed to the line amplifier circuit card in slot 6, where it is amplified and applied to the outgoing line. A selector switch at the output of the line amplifier normally connects the output through terminal 21 to transformer T2, which is provided with impedance matching resistors R108 and R109. The output impedance may be set by means of switch S106 to 150 or 600 ohms. Switch S105 is a three position switch providing 150-ohm, or 600-ohm termination of the outgoing line when it is not terminated externally. The outgoing line connects to connector J102. When the selector switch at the amplifier output is set to route the signal to terminal 20, an 8-ohm lousdpeaker may be driven directly from terminal 3 of PILOT connector J111.

Speaker return is to terminal 6. Earphone monitoring is provided by jack J103. This jack is "floating" and headphone leads should not be grounded. The output signal from T2 is applied through terminals 2 and 4 of the line amplifier board to an attenuator which supplies the attenuated signal for the VU meter through terminals 3 and 4, through the METER switch in positions 1 and 2, to terminals 14 and 16 on the power and meter assembly. Resistors in the attenuator may be changed to modify the working level from the +4 dbm normally provided. See table 10. Choice of 150-ohm or 600-ohm output does not appreciably modify the VU meter reading.

Since the meter attenuator is fixed for any given operating line level, and the fixed gain attenuator R104 and R105 is selected in the CAL. position of the METER switch, it is only necessary to adjust the GAIN CAL. potentiometer on the playback preamplifier board (7 and 7/9) to assure that a standard reference level tape is reproduced at the proper indicated level. Typically, such tapes provide a reference tone of 700 cycles which should read zero VU, attainable by adjustment of this control.

Having been so calibrated, the METER switch may be turned to the SIGNAL position. The REPRO. LEVEL gain control is then substituted for the calibrated attenuator, to provide convenient adjustment of playback level. When in this position, the signal output may be either the tape playback or the input signal. This transfer is provided by K102 contacts 8, 4, and 12 under control of pushbuttons S101 and S102, the A-B output selectors.

Note that when the METER switch is in the SIGNAL, ERASE, and BIAS positions, the audio signal is always fed in the same manner to the output, although the meter is connected to various circuits.

The Meter and Power Assembly, located in slot 5, is powered from the transport through J110 terminals 11 and 12. It provides regulated +28 volts at terminal 12 of all electronics. Non regulated dc is provided at terminal 18 to power the coil of K102 and the A and B lamps. 24 volts AC is provided at terminals 2 and 3 for external use, if needed. A resistor may be replaced with alternate values to provide control of the girghtness of the lamps in a remote meter fed from terminals 3 and 7 through the remote meter connector J109 terminals 3 and 6.

One position of the REC. SELECT switch, S103, has been discussed, the RDY position. In the SAFE position the coil of K101 is opened so that the record electronics are locked off to provide maximum protection for previously recorded tapes. All other circuits remain normal. In the O. DUB position the record head is completely disconnected from its normal feed and becomes a playback head.

When the record head is so connected, it feeds terminals 10 and 14 of the Overdub Preamplifier (7/9) in slot 9. This preamplifier is identical to the H and NAB preamplifier previously described except for the addition of an input transformer. When the record head is used in playback it matches closely the frequency response and gain of the normal playback head. Due to its wider gap, however, the extremely high frequencies suffer some attenuation depending upon the tape speed.

If the overdub feature is desired, it is highly recommended that a separate preamplifier be employed in each position; a 7 board in slot 7 and a 7/9 board in slot 9. It is not necessary that the user have both the H and NAB Preamplifier and the Overdub Preamplifier since the latter may be extracted from slot 9 and re-inserted in slot 7. The input transformer is then bypassed and operation is identical to the normal preamplifier.

## DYNATRACK ELECTRONICS

Read the above description of the NAB electronics for more details of certain aspects of the electronics common to both systems. Refer to the electronics block diagram, figure 34.

As in the description for NAB above, the signal is recorded directly on the H or NAB track. There is a tap in the H and NAB Record Board which is not used for normal NAB recording, but which feeds out the signal fully equalized for NAB operation on terminal 2. This is applied to the L Record and Bias Board (3D) in slot 3. Note that this replaces the NAB Erase Coupler Board (3D) used for NAB recording. Board 3D provides a record amplifier to drive the second, or L, record head; and it includes the special equalizer required by the Dynatrack system. It includes a linearizer as previously described. Its output through terminal 15 is fed to the record relay K101, where it is normally grounded by contacts 10 and 2.

During recording, the signal is fed from K101 contacts 10 and 6 back to terminal 16 where it passes through a tuned bias trap, and picks up bias injected at terminal 21. The signal goes out on terminal 18 to the record head for the L track. The record head return lead is to ground. TP. BIAS provides a test point and the BIAS MON CAL. control permits calibration of the VU meter to indicate proper bias current for the L track when the meter switch is in the ERASE position.

Terminals 11 and 20 have no connection on this board; these were used to furnish power to the erase head in the NAB configuration. When Dynatrack is employed no erasing facility is provided. Instead, the erase power amplifier on the board in slot 1 is used to feed power on terminal 20 to terminal 21 on the L Record and Bias Board, where the BIAS ADJ control provides adjustment of bias current in the head. The feedback resistor feeds from terminal 19 of the H Bias and Erase Board and in this case a lower resistance holds down the excitation of the amplifier to a greater degree than when it is used for erase power.

The LEVEL control on the Dynatrack L Record Amplifier board provides for proper adjustment of the recorded level of the L track with respect to the H track, for any given frequency. On playback the H track is reproduced in the normal manner by the board in slot 7 as described above. The L track, on the other hand, is reproduced by the L Preamp and Switch Board (8D) which must be inserted in

slot 8. As described above, when this is employed the NAB conversion board (8N) must be removed from slot 8 to break the connection between terminals 17 and 16. If this board was not previously provided the link between terminal 17 and 16 behind the connector must be cut, since it is necessary for the signal from the H track to pass through the electronic switch on the L preamp and Switch board.

In addition to providing a preamplifier, it is necessary for this board to provide equalization to deemphasize the specially recorded characteristic of the L track. Thus at terminal 16 the signal is identical in frequency response and level to that from the H track coming in on terminal 17.

Since the L track is recorded at a much higher level than the H track for some frequencies, it is necessary to switch from "L" to "H" at high signal levels, and this is done by the electronic switch under control of its Schmitt trigger. The switching level is determined by the setting of the TRIG. control. Following the switch an output amplifier feeds the signal to the line amplifier, etc., in exactly the same manner as previously described. The L preamplifier and switch board also includes variable equalizers to permit adjustment of overall frequency response, and phase equalization for 15 ips, since the Dynatrack system is designed to be operated only at this speed.

## DETAILED CIRCUIT DESCRIPTIONS

The following paragraphs contain detailed descriptions of each of the circuit boards, and the Meter and Power Supply Assembly.

### H and NAB Record Amplifier (4) (See Figure 39)

The input signal to be recorded is applied at terminal 14, after it has passed through the input transformer and level control. C1 couples it to Q1, which is biased to the proper operating point by R1 and R2. After amplification the signal is coupled by C3 to an equalizer network, producing a preemphasis characteristic at the high and low frequency extremities of the spectrum in accordance with standard NAB practice. This is accomplished as follows.

Consider R6 and R7 as an attenuator network, with R8 short circuited, as it effectively is at high frequencies because of C4 and C5. This attenuator network reduces the voltage swing at the junction of R6 and R7 from what it was at collector of Q1. However, if a bypass capacitor C18 or C19 is connected across R6 it permits the high frequencies to suffer less attenuation. The degree to which this is true depends on the setting of the variable capacitor. Practical values of C18 and C19 make it necessary for the junction of R6 and R7 to appear always as a very high impedance. Current cannot be drawn from this point without upsetting the equalization characteristic. Thus, the junction is used to drive a field effect transistor, Q2. C4 and C5 show increasing impedance as the signal frequency is lowered;

therefore, the voltage at the junction of R6 and R7 would continue to rise as the frequency drops, except that R8 provides a shelving off to prevent unnecessary sensitivity to subaudible frequencies.

Relay K1 automatically changes the high frequency equalization when tape speed is changed. The output of Q2 is applied to terminals into which may be inserted values of C8, C20, R11, and R12 to adjust for any requirement arising for shelving equalization in addition to the normal NAB equalizers just described. All four components may be eliminated in many instances, a jumper being furnished across the R11 or C20 terminals.

After this network the signal is fed to the base of Q3 whose bias is set by R13, R14, and R15. This operates with Q4 in a Darlington circuit to provide gain and low impedance output at C11 to drive the NAB record head. R18 normally provides a degree of degeneration, determined by the setting of R20, and R19 in series with C12, and C21. But the degree of degeneration can also be reduced by conduction of Q5 and Q6 when S1 is closed. Q5 and Q6 act to change the degeneration with instantaneous signal amplitude, thus they tend to deform the signal whenever its amplitude attains a value sufficient to overcome their contact potential. This results in a distortion, inverse to that which overload of the tape normally introduces. By employing Q5 and Q6 in this manner, and properly adjusting the overall degeneration by means of R20, the LIN ADJ. control it is possible to introduce the proper corrective distortion into the recording process so that the normal 3% tape distortion point shows somewhat less than 1%.

C11 feeds the record head connected at terminal 22. R22 is a resistor in series with the head to establish a constant current characteristic. R23 provides a high resistance path to ground so that the ground side of C11 will always be discharged, even when no head is connected to terminal 22. This is a menas of preventing accidental record head magnetization.

The signal effective in driving the record head may be extracted at terminal 2 to be applied to the L track record amplifier when the Dynatrack system is employed.

Terminal 16 provides a point for injecting a pilot frequency for playback tape speed control. This is useful in motion picture synchronization. The pilot for either a high or low frequency system may be employed. C14 couples the input signal to Q7. The gain of Q7 is adjusted by the combination of emitter resistors R27 and R28, which is bypassed by C16 to provide the proper range of signal levels to R30. This control, RECORD MON CAL., can be conveniently adjusted to serve the input signal audio monitoring and input signal VU meter monitoring circuits. R29 and C17 are provided to give a slight rise in output at 15 kc to make up for losses in the input transformer, wiring, and meter sensitivity occurring at the extreme end of the spectrum.

## L Record and Bias (3D) (See Figure38)

Signals to be recorded are first applied to the NAB record board (H and NAB Record Amplifier) (4), and after proper equalization to obtain the NAB recording characteristic, the signal is fed to this board at terminal 2. Since this amplifier must adequately record signals of extremely low level, it is essential that it contribute a minimum of self-generated noise. Therefore, Q1 which must be fed from a comparatively high impedance source, is a field effect transistor. Its output feeds the LEVEL control whose output feeds Q2. Since R9 is a relatively high resistance, 510 ohms, degeneration is high in this stage. It is bypassed by the network R7, C5, and C6; and these capacitors begin to take effect above 400 Hz, causing the gain of the stage to rise. R7 provides a limit to the rise so that the gain of Q2 shelves off at 15 kHz, 8 db above its 400 Hz value. The output of Q2 is coupled to Q3 where a similar operation occurs with about 7 db lift at 15 kHz. These two equalizer amplifiers provide a rising frequency response starting at 400 Hz and shelving flat at 15 kHz with a total of 15 db rise. This gives the distinctive record equalization of the Dynatrack system. L1 and C8 constitute a series resonant bias trap (120 kc). The signal from Q3 is applied to the Darlington amplifier Q4 and Q5, and the output and linearity features are the same as described above for the NAB record board.

The signal output from this record amplifier goes from terminal 15 to the record relay, then returns to terminal 16, going through the bias trap L2, C19 to terminal 18 and then directly to the record head. Bias power from the bias and erase board is applied at terminal 21. C16 tunes the output stage of the bias amplifier to resonance through the return lead on terminal 13. R31, fed from C18 provides feedback control of the bias power amplifier by connection to terminal 19. R32 BIAS ADJ. adjusts the amount of bias applied to the record head.

CR1 and CR2 feed both ends of the NOISE BAL. potentiometer R28. Consider the wiper run up to the top. CR1 then supplies a positive potential directly to R29. R30 allows some current of positive polarity to leak through R32 and the record head. If the wiper is run all the way to the bottom, CR2 supplies a negative polarity and the DC current in the head is in the opposite direction. By varying the position of the arm more or less DC current can be permitted to flow through the head in either direction to balance out residual magnetization of the record head or strong external constant magnetic fields, during the recording process.

Terminals 14, 17, and 22 provide connection to the VU meter when the METER switch is in the ERASE position. R26, BIAS MON. CAL., provides for calibration of the monitoring meter when it reads the bias strength. When the recording circuit is adjusted to provide proper bias to the head for optimum performance, this control should be adjusted to read -5 VU, and then left without further adjustment for reference purposes.

## Bias and Erase Amplifier (1) (See Figure 36)

Whenever the transport is put into the recording mode, a 120 kc signal is generated within the transport, and applied to all electronics assemblies where it appears on terminals 14 and 15 of each Bias and Erase Amplifier. T1 operates as a bridging transformer. It has two secondaries. One of these feeds the base of Q2 through resistor R4. This resistor is employed to permit insertion of a feedback signal from R26. Q1 amplifies the 120 kHz signal and provides sufficient power to drive the push pull amplifier Q5 and Q6. C13 and C14 tune the secondary of T4, and C16 and C17 tune the primary of T5 in order to minimize harmonic distortion. Even order harmonics are particularly objectionable since they result in increased background noise recorded into the tape.

The output of O5 and Q6 is fed through T5 and C18 to R19 and R24, the latter variable to control the amount of 120 kHz bias signal fed through terminal 1 to the record head. The audio signal comes from the record amplifier and is applied at terminal 22. It passes without loss through the tuned circuit L2, C19, and C21 since this is only tuned to present a high impedance to 120 kHz, thus preventing loss of bias power back into the record amplifier.

CR2 and CR3 each operate as half wave rectifiers. If the arm of R23 is run to the end connected to CR2, then the upper end of R21 will have an average negative potential. Conversely, if the arm is run to the other end, then the upper end of R21 will have an average positive potential. R20 allows current set up by such potential to flow through R19 and R24 to the record head, thereby making it possible to inject a very small but adjustable DC current into the head in addition to the audio and bias frequencies to allow minimization of noise resulting from strong external magnetic fields or even order harmonic distortion from the bias supply.

These circuits are activated by application of potential at terminal 12. In order to prevent a recorded thump when the record button is depressed, R27 and C20 are provided to permit the DC bias on the base of Q1 to rise slowly, and C15 is provided across R17 for the same purpose on Q5 and Q6. The bias envelope therefore grows to operating level in a matter of about 10 milliseconds. When the recording mode is deactivated another thump or click is avoided by allowing reservoir capacitor C2 to permit the bias waveform to decay to zero over a period of about 60 milliseconds. R1 allows C2 to charge at a reasonable rate when the circuits are activated without causing a surge on the power supply, but CR1 permits the capacitor to be connected directly to the load during discharge. L1 and C1 constitute a filter to stop bias frequency ripple on the power bus connected to terminal 12.

The amount of drive applied to Q5 and Q6 is controlled by feedback resistor R26, which also improves the waveform at the output by cancelling out internally generated distortion products.

The second winding of T1 feeds the 120 kHz signal to an almost identical circuit except that the output transistors Q3 and Q4 have a higher power rating in order to supply the erase head with sufficient drive to completely erase a saturated tape. The description above applies except for a few points. The secondary of T3 is tapped to provide two output impedances. One of these, connected to terminal 21 supplies erase power in the case of a NAB setup. In Dynatrack operation no eraser is excited and power is fed from terminal 20 to the record head of the L channel. This amplifier then operates as a bias supply rather than an erase supply. The feedback resistor, which in this case is external to the board, is connected between terminals 21 and 19 in the erase setup and between 20 and 19 in the Dynatrack setup. The resistor values are naturally different for the two cases. Erase or L bias current is monitored across the 10 ohm resistor R29 between terminals 16 and ground. The NAB or H bias current is monitored from terminal 2, the record head return lead to ground, with R25 providing the meter calibration. This bias current is read on the meter when the meter switch is in the BIAS position.

Meter calibration for the monitoring taken across R29 is accomplished by a control on the L Record Amplifier Board when Dynatrack is employed, or by a control on the NAB conversion board which fits into the slot occupied by Dynatrack's L Record Board (slot 3) when the electronics are converted to NAB operation. In the Dynatrack system the meter then indicates bias for the L track. In the NAB system it reads erase current. In either case, the reading is obtained by putting the meter switch into the ERASE position.

### H and NAB Preamplifier (7) (See Figure 42)

This plug-in printed circuit board assembly provides the required signal amplification of the playback head signal to drive the output line amplifier. In addition, the assembly performs the necessary frequency equalization and phase correction for two tape speeds.

The playback head for the NAB or Dynatrack H track is connected to the assembly through terminal 4 which provides the signal path through C1 and R2 to the base of Q1, the first amplifier stage.

The collector of Q1 is direct coupled to the base of Q2, providing a signal path and DC bias to the second amplifier stage. The output of Q2 is direct coupled to the base of Q3. A feedback path is also provided from the collector of Q2 through one of two RC frequency equalization networks to the emitter of Q1. Relay K1 in the normal or deenergized condition (as shown for high speed tape operation) places C7, R18, R19, and R20 in the feedback path. When K1 is energized, C8, R21, R22, and R23 are placed in the feedback path, providing the proper frequency equalization for slow speed tape operation. C7 (or C8) with R20 (or R23) controls the point where the customary 6 db per octave correction becomes no longer effective at higher frequencies. R19 (or R22) controls the point at very low frequencies where the relation again no longer holds true and the amplifier shelves off. The proper operating point for Q1 and Q2 is maintained by the dc bias established at the junction of

R8 and R9 in the emitter circuit of Q2. This dc bias is applied through R5 to the base of Q1, thus providing a controlled amount of negative feedback to Q1 in relation to the input signal level. C4 filters out any ac component present at the junction of R8 and R9.

Q3 operates as a phase distortion correction stage. Considerable rotation of phase normally occurs in the overall process of recording and playing back tape, the situation being increasingly pronounced at shorter wavelengths. In copying tapes, the effect is compounded. Q3 and its associated circuits provide an effective correction for such distortion.

A paraphase signal output condition exists between the emitter and collector of Q3; that is, equal amplitude with 180 degree phase difference. C5, which couples the collector signal to the base of Q4, presents a high impedance to the low frequencies contained in the recorded signal. R13 (or R13 in series with R14, depending upon the state of K2) feeds the emitter signal directly to the base of Q4. As a result of this action, the low frequency phase components present at the emitter of Q3 predominate at the base of Q4 and are 180 degrees out of phase with the same signal at the collector of Q3. Conversely, capacitor C5 presents a very low impedance to the higher signal frequencies allowing them to pass readily to the base of Q4.

At intermediate frequencies, the vector sum of R13 (R13 and R14) causes the signal to be applied to the base of Q4 at some intermediate phase angle between zero and 180 degrees while the amplitude remains constant throughout the entire frequency range.

The result of this frequency/phase shift action cancels the inherent phase distortion on the signal caused by the magnetic transfer characteristics when the signal was recorded on the tape.

In fast tape speed operation, K1 is deenergized as shown. During slow tape speed operation K1 is energized which removes R14 from the circuit.

Emitter follower Q4 provides the required signal isolation and impedance output requirements. C6 couples the signal from the emitter to the gain control R17, and then out to the A-B switching relay through terminal 22. R16 and terminal 21 provide an outlet for signals bypassing the gain control. This output is provided for the extraction of any pilot signal mixed with the audio. Filtering of the pilot from the remaining signals must be accomplished externally of the signal electronics provided with the Series 400 equipment.

Q5 is a series voltage regulator which provides regulated power from the input bus terminal 12 to the four transistor stages in this assembly. R24 and R25 establishes the proper operating point for Q5, thus establishing a fixed voltage drop across Q5. C15 provides filtering of any power supply ripple on the regulated voltage. C9 filters any ripple at the base of Q5.

## H and NAB Preamplifier with Overdub (7/9) (See Figure 44)

This unit is exactly the same as the "H" and NAB preamplifier described above and is interchangeable with it. It includes an input transformer which is employed when it is desired to monitor a recording using a record head as a playback head for synchronizing purposes. In this application the record head is connected to terminals 14 and 17.

The output of T1 at terminal 16 is automatically connected to input terminal 4 when this card is inserted in slot 9.

Maximum convenience is afforded if a conventional H and NAB preamplifier or an overdub preamplifier is inserted in slot 7 and an overdub preamplifier is also inserted in slot 9, since it is then only necessary to employ the record select switch to change from normal record to overdub operation. Economy but less convenience is obtained with a single overdub preamplifier, changing its location from slot 7 to slot 9 when changing the switch from normal record to overdub. Great care must be exercised to turn off the machine completely before moving the 7/9 card from slot 9 to slot 7 since the playback head may be magnetized from a charge residual on C1 unless sufficient time is permitted for it to discharge completely.

## Line Amplifier (6) (See Figure 41)

This is a full-spectrum flat response amplifier which provides sufficient gain and output power to adequately drive an outgoing line at up to peak level of +28 dbm (600 ohms) or to drive a loudspeaker with up to one watt peak excitation (distortion 1% THD).

Q1 is an emitter follower accepting an input impedance of 10,000 ohms or lower, and providing low impedance excitation for Q2. Q2 drives Q3 and Q4 (complementary symmetry types) to result in push-pull excitation of Q5 and Q6. A required static potential difference between the bases of Q3 and Q4 is established by the contact potential drop across CR1, CR2, and CR3.

CR4, R20, and C12; CR5, R19, and C11 are drift compensation networks to stabilize the operating points of Q5 and Q6. DC operating point for these two transistors is set by R13, R14, and R15; and Q2, Q3, and Q4. A feedback path through C13, R21, and R22 assures minimum distortion for all signal frequencies. C15 and R23 provide a stabilization network to reduce the possibility of high frequency oscillations (parasitics) when certain types of loudspeakers are connected through S1 to terminal 20, and ground. In the alternate switch position the amplifier feeds out on either terminal 21 or 22 to the matching output transformer mounted in the main module, whose purpose is to match the amplifier to a 150 or 600 ohm line. R24 provides a small impedance in series with certain type transformers which would otherwise approach a short circuit at extremely low frequencies and thereby upset the stability of the amplifier at frequencies in the order of one cycle or less.

R1 and R3 are fixed resistors which may be readily changed to alternate values to change the working line level as indicated by the VU meter. The amplifier is normally equipped with the proper values for reading a plus four dbm 600 ohm line. To operate from a +6, +8, or +14 dbm, 600 ohm line, select ±5% calibrating resistors according to the following table 10.

Table 10. Line Operating Level Calibrating Resistors

| LINE OPERATING LEVEL - 600 OHMS | VALUE OF CALIBRATING RESISTORS | |
|---|---|---|
| dBm | R1 | R3 |
| +4 | 3.9K | 7.5K |
| +6 | 4.7K | 6.2K |
| +8 | 6.2K | 4.3K |
| +14* | 7.5K | 3.3K |

* Operated in 150 ohm position with R109 on switch S106 removed.

CR6, CR7, CR8, and S2 are associated with the automatic A-B transfer switching system. CR6 and CR7 are isolating diodes permitting all modules to be operated from pulses originating in the transport, but preventing the transfer buttons on any single module from simultaneously activating the transfer circuits of other modules. CR8 is an inductive suppression diode effectively across the coil of the A-B transfer relay.

#### L Preamplifier and Switch (8D) (See Figure 43)

The playback head for the L track in the Dynatrack system is connected with the signal lead at terminal 6, the signal return at terminal 7, and the shield of the connecting cable which covers these two conductors is connected to 8. By the shortest possible physical path the signal is coupled through C1 to the base of Q1. The signal and dc output of Q1 are applied to the base of Q2 where they are amplified. The signal is fed back to the emitter of Q1 through the equalizer network C11, R47, R48, and R49. C11 with R49 controls the point where the customary 6 db per octave correction becomes no longer effective at high frequencies. R48 controls the point at very low frequencies where the relation no longer holds true and the amplifier shelves off.

Q1 and Q2 are at all times properly biased due to the feedback path from emitter of Q2 to the base of Q1 through R5.

The signal is passed on to Q3 which is a phase distortion correction stage. Considerable rotation of phase normally occurs in the overall process of recording and playing back tape. The situation is increasingly pronounced at shorter wavelengths. In copying tapes the effect is compounded. Q3 provides a very effective correction for such distortion through C5 and R13. Note that the signal voltage at both the collector and emitter are identical but 180 degrees out of phase.

For low frequencies C5 is a very high impedance, and R13 feeds its signal directly to the base of Q4 which presents a high impedance since it is an emitter follower. At very high frequencies, on the other hand, C5 has a very low impedance and consequently it feeds its signal to Q4 at a phase displacement of 180° from that of R13. At intermediate frequencies the vector sum of the R13 and C5 signals result in a signal at Q4 of some intermediate phase angle between these extremes, but the amplitude remains constant which is most essential.

Emitter follower Q4 feeds the signal to the gain controls R15 and R27. The output of R15 is applied to the deemphasis network R16, R17, C7, R18, R19, and C8. Its output at C9 represents an equalization characteristic which is exactly the inverse of the preemphasis curve generated in the Dynatrack record board. In some cases C7 and C8 are trimmed by small parallel capacitors. The signal from C9 is applied to a double emitter follower circuit, Q5 and Q6. This is to provide a conveniently low impedance at the output signal terminal 16, yet provide a very high impedance to the output of the equalizer at C9. Switch S2 removes the deemphasis equalizer from the circuit so that playback from a standard NAB alignment tape may be used for aligning the adjustable equalizers. It is then only necessary to operate S2 to insert the network in order to convert the board to Dynatrack equalization.

Under normal low signal level conditions the preamplifier feeds directly through Q6 to the output. The output of the second or H track is applied at terminal 17. R50 is a photo resistor unit. The lamp is normally dark so that resistance of the photo element is very high (approximately 100 megohms). When the lamp is lit, however, it drops to a very low value, (less than 500 ohms). When this happens the high or H track provides the signal source and short circuits the high impedance junction of R18, R19.

The lamp in the photo resistor unit,R50, is controlled indirectly by the signal level at the output of Q4, as follows:

R27, TRIG., provides an adjustable amount of this signal to a transistor amplifier Q8. Q9 is normally conductive in the absence of an input signal from R32 because its base is connected to the positive bus through R33. This causes the collector to be at a low voltage due to voltage drop across R34, and since the base of Q10 is direct coupled through R36, Q10 is cut off.

If the peak excursion of the audio input signal exceeds a certain critical value in the negative-going direction, the Q9 collector current is reduced. The collector potential rises, bringing Q10 into conduction. This causes the emitter potentials to rise further cutting off Q9 and driving Q10 into saturation. There are thus two stable states for the collector of Q10. When the peak signal amplitude drops below a certain critical value, Q10 cuts off by the same process in reverse. Q9 and Q10 constitute a Schmitt trigger.

In its normal nonconductive condition Q10 applies zero volts potential through R39 as measured from base to emitter of Q11. Q11 is therefore nonconductive and the junction of C15 and R40 is at zero volts potential above ground. Whenever Q10 is rendered conductive, and this can be just a few degrees of a single cycle of any frequency up to 15 kHz, Q11 is also rendered conductive. It immediately charges C15. This capacitor does not lose its charge for about 5 milliseconds through R41.

The instant a charge is placed on C15 by conduction of Q11 this above ground potential is applied through R42 to the base of Q12 bringing it into full conduction. When C15 is discharged, Q12 is fully cut off. Q12 is a high voltage transistor operating from the 120 V DC supply at terminal 15. When Q12 is conductive the 120V supply furnishes current through R45 and R51 to the neon lamp in the photo resistor unit in parallel with R43. The lamp lights and causes the resistance of the photo resistor element to drop, permitting the signal from the H track, terminal 17, to be applied to Q5 instead of the signal from the L track since it shorts out the latter. When Q12 is cut off the collector potential rises, permitting the pilot indicator lamp DS1 to light. R43 causes the voltage across the lamp in the photo resistor unit to drop well below its extinction voltage so the resistance of the photo resistor rises to its dark value.

When Q11 becomes conductive, C15 charges very rapidly causing the lamp in the photo resistor unit to light within one millisecond after a signal component amplitude exceeds the triggering level. When Q11 cuts off, however, C15 discharges over a considerable period of time assuring that the lamp is not extinguished until the succeeding cycle of signal is observed to see if it is of sufficient amplitude to again trigger the Schmitt and keep the lamp lit. The lowest frequency of interest in this regard is about 400 Hz.

S1 has three positions. In the center AUTO position the photo resistor is controlled automatically by the incoming audio signal. In the HI position the base of Q11 is connected to ground, so as to keep DS1 off at all times and the lamp in R50 on. In the LO position the base of Q11 is connected to the positive supply, cutting it off, turning on DS1 and cutting off the lamp in R50.

Q7 is a regulator transistor intended to drop the input bus voltage by a fixed amount determined by the values of R25 and R26, and to filter out any power supply ripple by means of C18 and C17.

**Meter and Power Supply Assembly (5) (See Figure 40)**

This unit contains the power transformer, a large filter capacitor, the VU meter, and a regulator circuit to assure that the output of +28 volts is maintained within a few millivolts under varying load conditions.

Line voltage is applied to terminals 5 and 20, through the 1/2 ampere fuse F1 to the power transformer. The transformer secondary feeds a bridge rectifier CR1, CR2, CR3, and CR4 charging C1 through surge limiting resistor R1. Q1 is the power regulator transistor. R2 has a very low resistance and is used to monitor the load current. Its action will be described below. The regulated dc output is taken from terminal 12, positive, and terminal 9, negative and ground. R7 and R8 are in series across the output terminals. Any variation in output voltage is therefore monitored by the base of Q3 which amplifies the base voltage variation because the emitter is kept at constant potential by zener diode CR6. The amplified variation is applied to the base of Q2 where it is further amplified and applied to the base of Q1, thus compensating for the initial variation.

If the power supply is loaded too heavily, so as to possibly damage Q1, the voltage drop across R2 causes a potential difference to occur across the base and emitter of Q4. However, this is only after the drop across R2 is sufficient to exceed the contact potential of CR5, and CR5 becomes conductive. Thus this circuit is inactive until a definite load is exceeded. When Q4 becomes conductive, it takes control of the regulator circuit and causes the output voltage to drop with increasing load, thus protecting the control transistor Q1.

Terminals are provided for R9 which may be jumpered out for maximum brilliance of the meter lamps. R10 is a similar resistor or jumper for the lamps of an external remote meter.

Resistors R11, R12, and R13 are part of the A-B transfer circuit, other components of which are wired into the main assembly.

**NAB Erase Coupler (3N) (See Figure 37)**

This is a very simple board which connects the erase power amplifier on board 1 to the erase head and permits monitoring erase current. When switching to Dynatrack this board is replaced by the Dynatrack record amplifier which fits into the same slot and rearranges connections so that proper bias is supplied to the L track.

When this board is used, 120 kHz power from the erase amplifier is supplied to terminal 20. C1 forms a resonant circuit with the erase head to provide maximum head current. R1 is the feedback resistor controlling the overall erase amplifier drive. Terminal 17 is connected to the head return which is isolated from ground by 10 ohms in the erase amplifier chassis. This point and the test point connected to it becomes a monitoring point for 120 kHz current. R3 permits erase meter calibration.

# SCHEMATICS

This section contains schematics of the tape transport, electronics assembly, and each of the circuit boards used for NAB and Dynatrack operation.

This 3M M23 manual
was
"scanned by the klettster"
as a GIFT*

to those who have these machines
and want to keep them operational

The 3M M23 was the first 3M iso-loop
tape recorder for professional use

3M M23 machines were around 45 years
old at the time this scan was made

enjoy this...
keep the reels turning

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I'll leave that for others to debate.

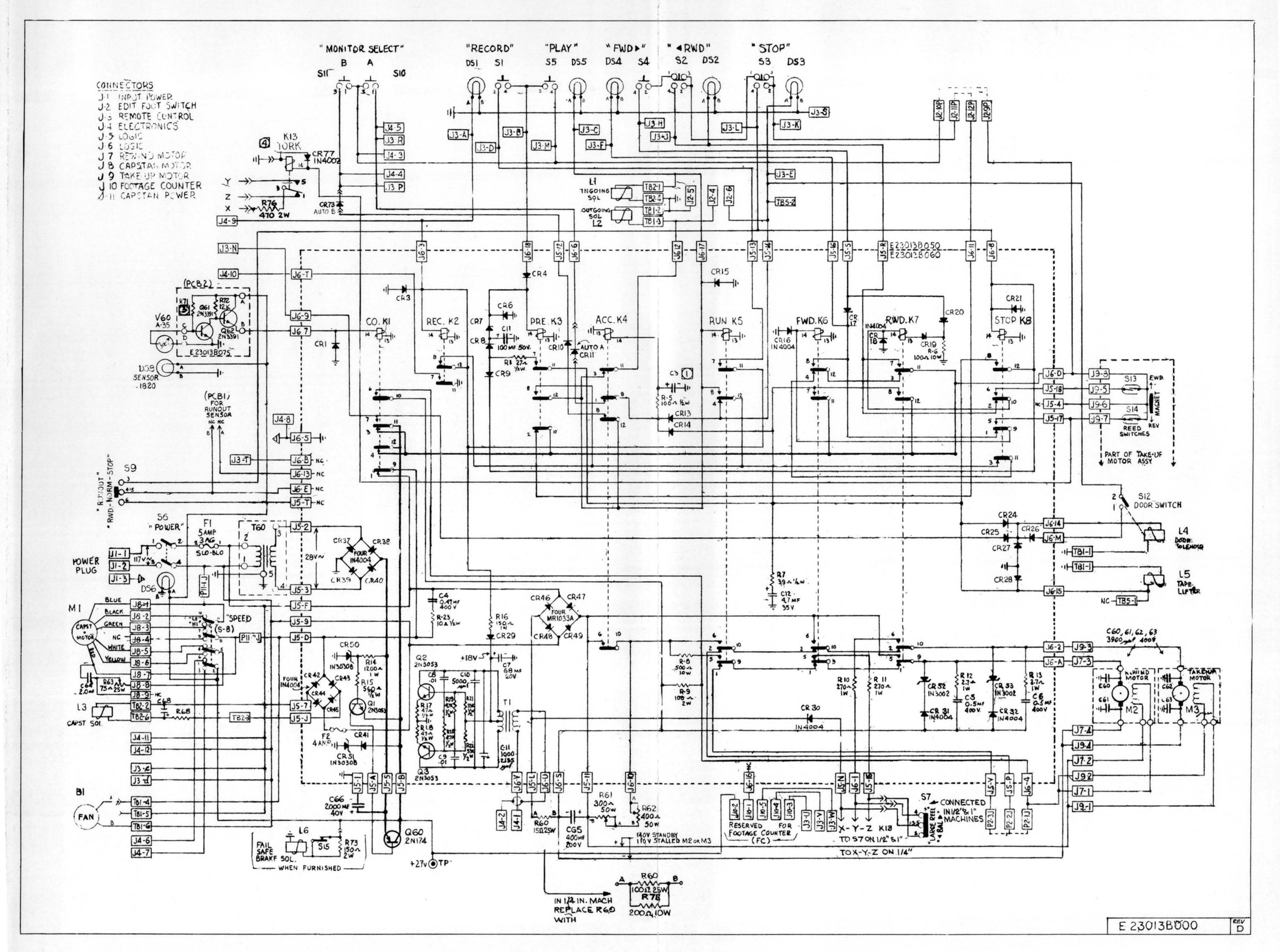


Figure 31. Tape Transport Schematic

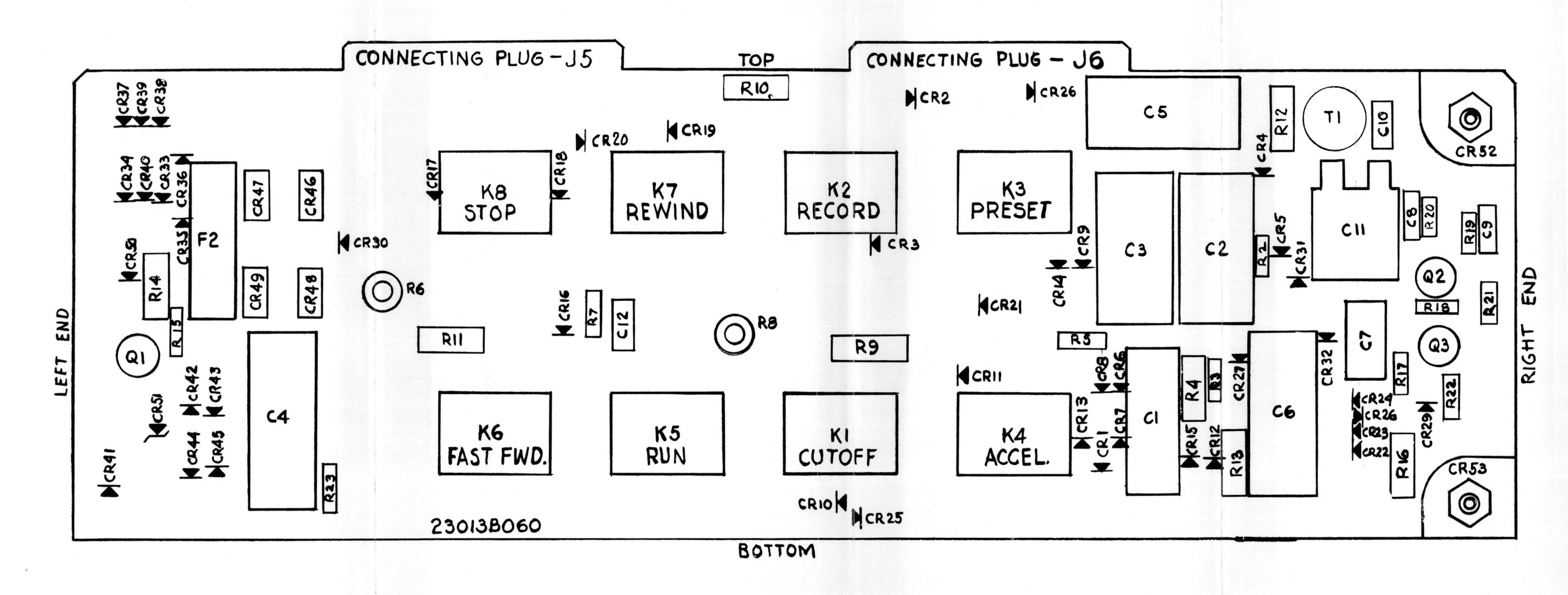



Figure 32. Tape Transport Circuit Board Layout



Figure 33. Tape Transport Wiring Diagram

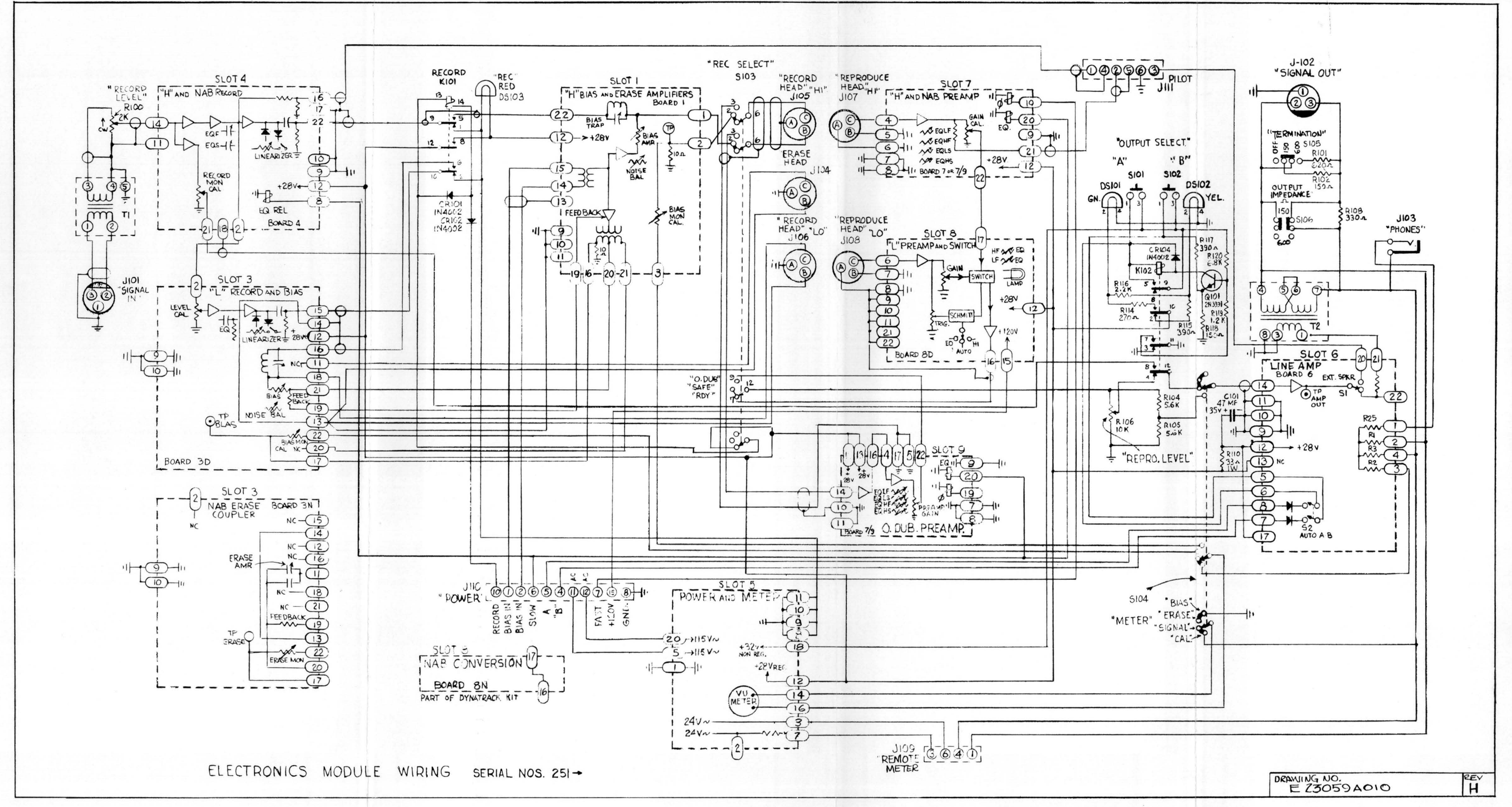



Figure 34. Electronics Block Diagram

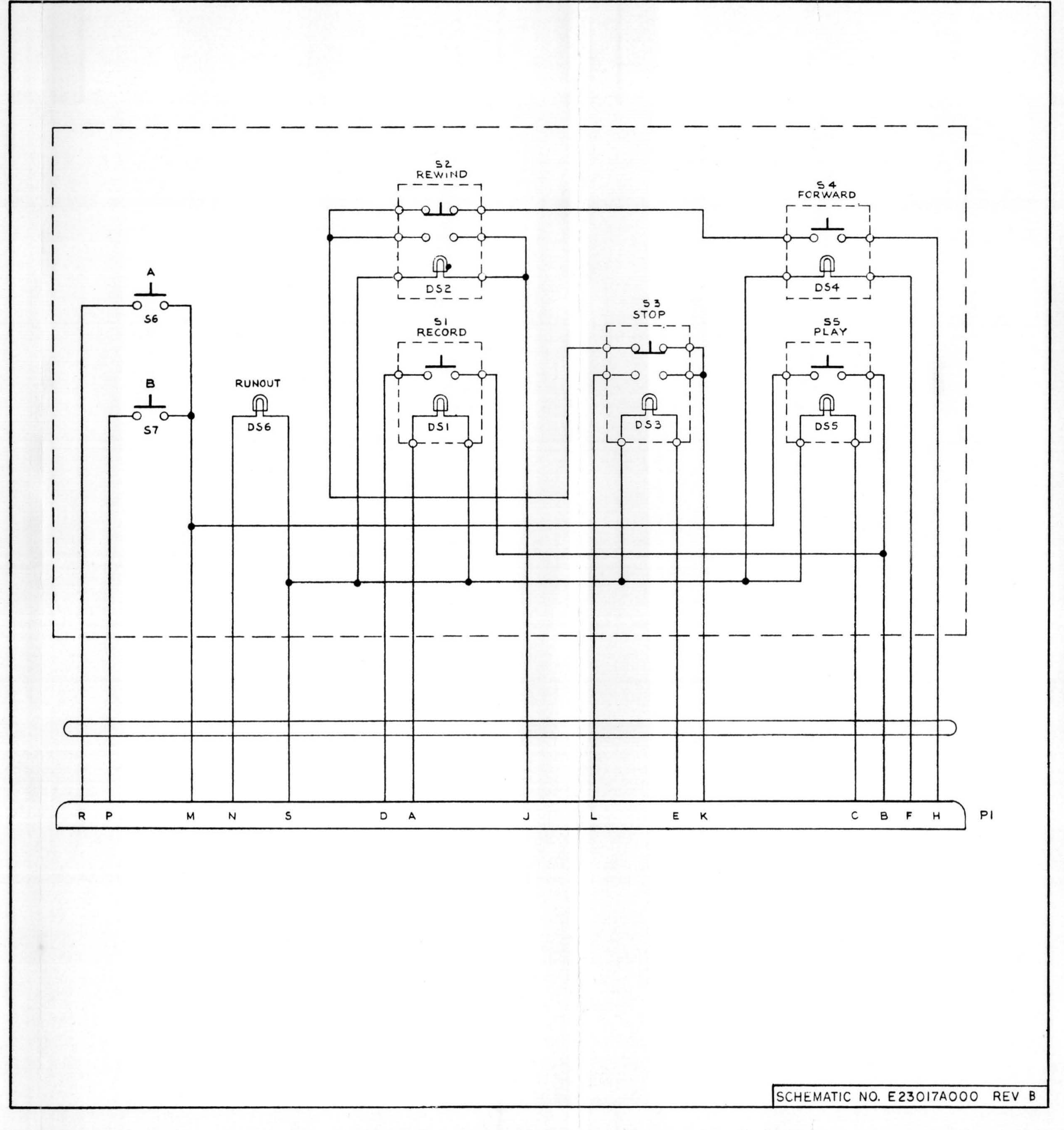



Figure 35. Remote Control Assembly Schematic

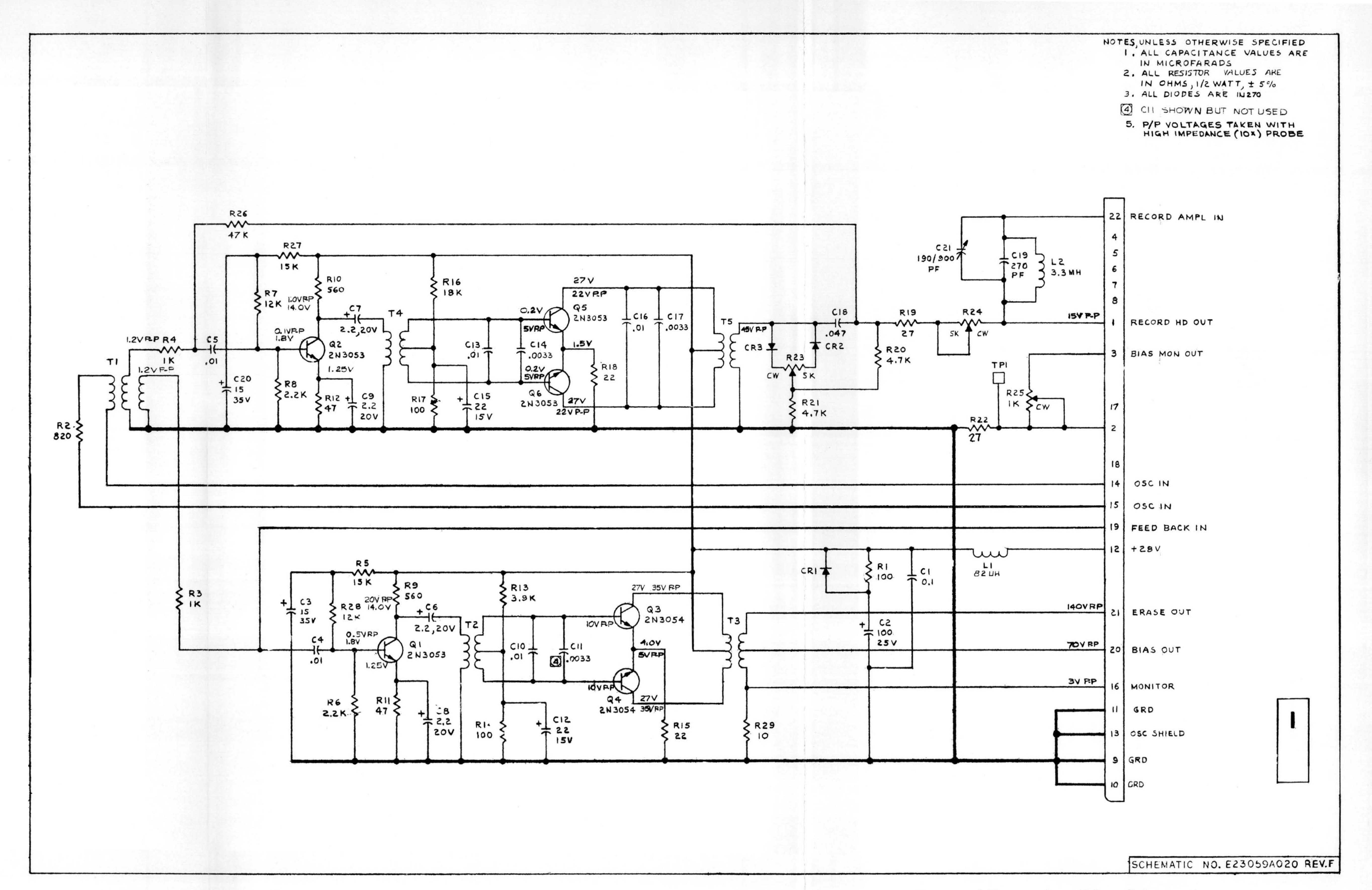



Figure 36. Bias and Erase Amplifier Schematic

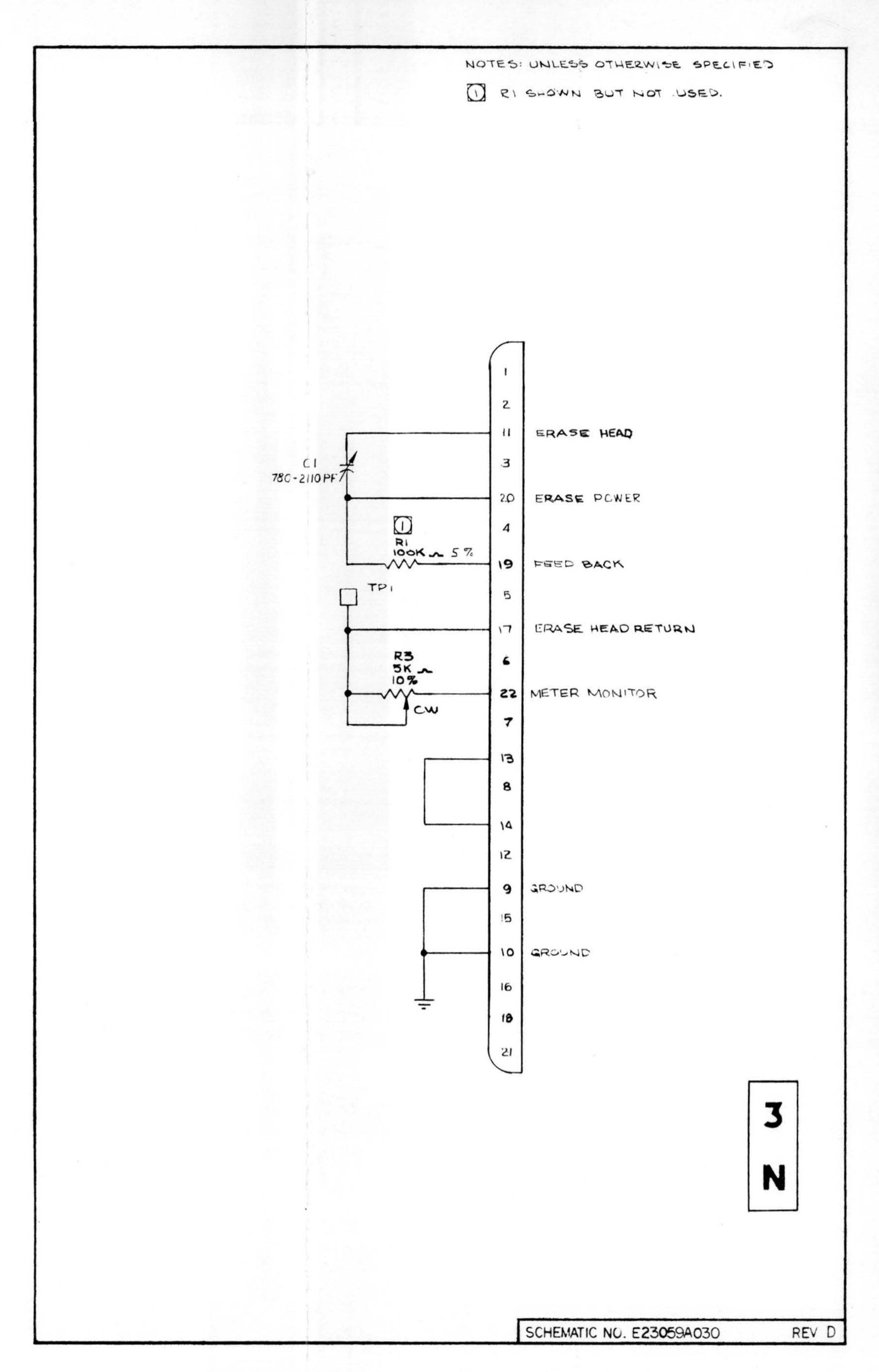



Figure 37. NAB Erase Coupler Schematic

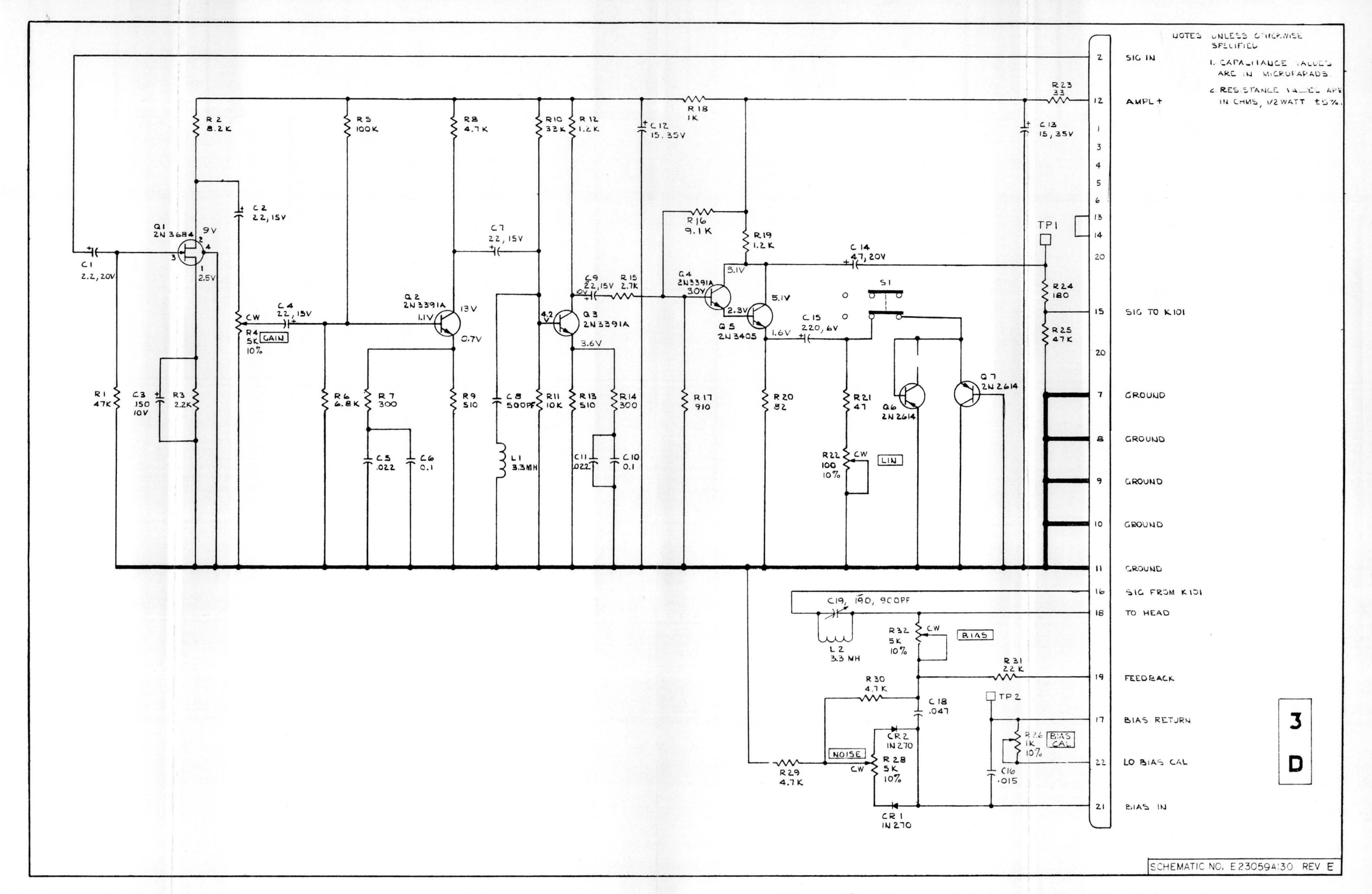
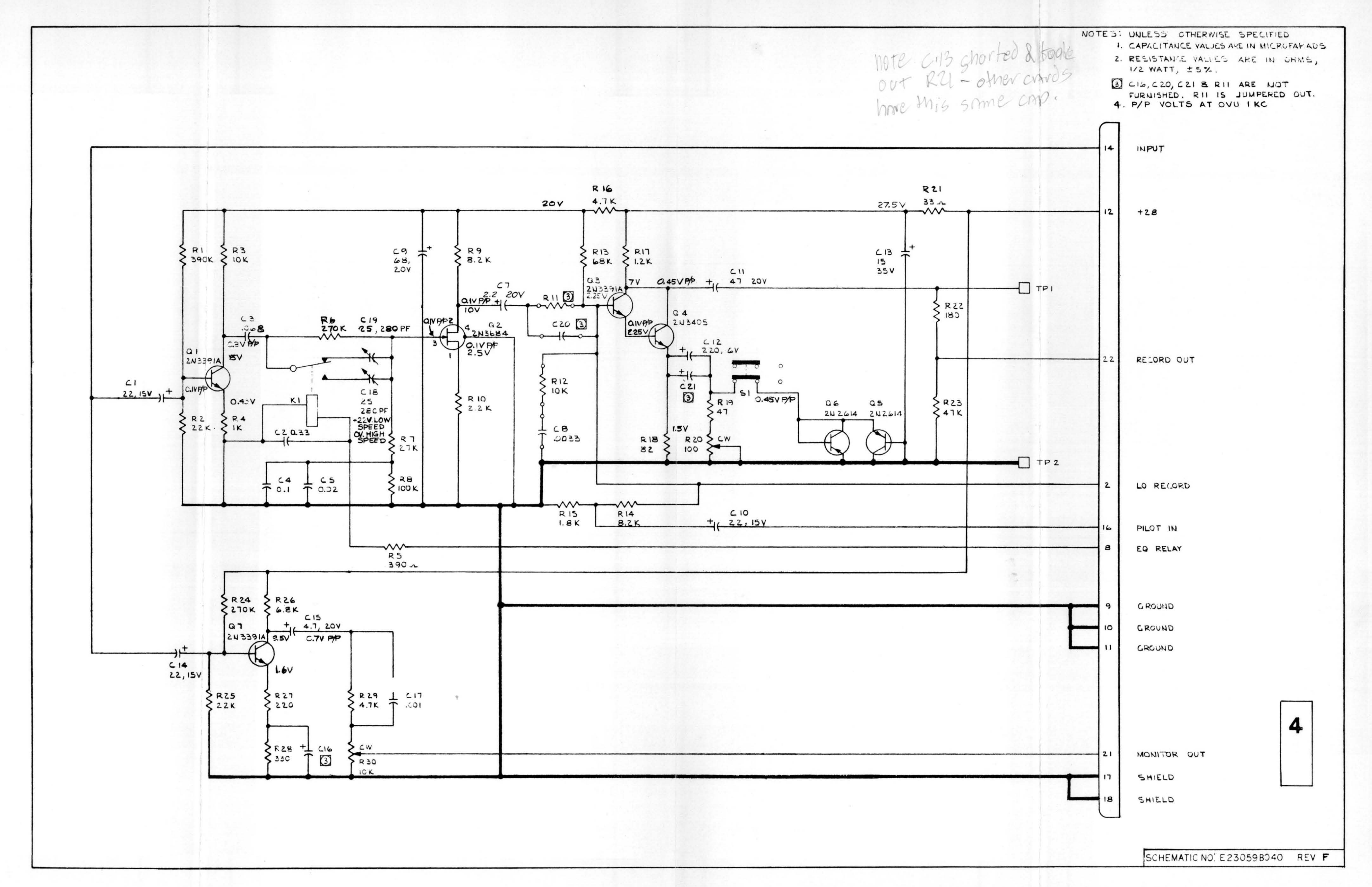



Figure 38. Dynatrack L Record Amplifier Schematic



SCHEMATIC NO. E230598040 REV F

Figure 39. H and NAB Record Amplifier Schematic

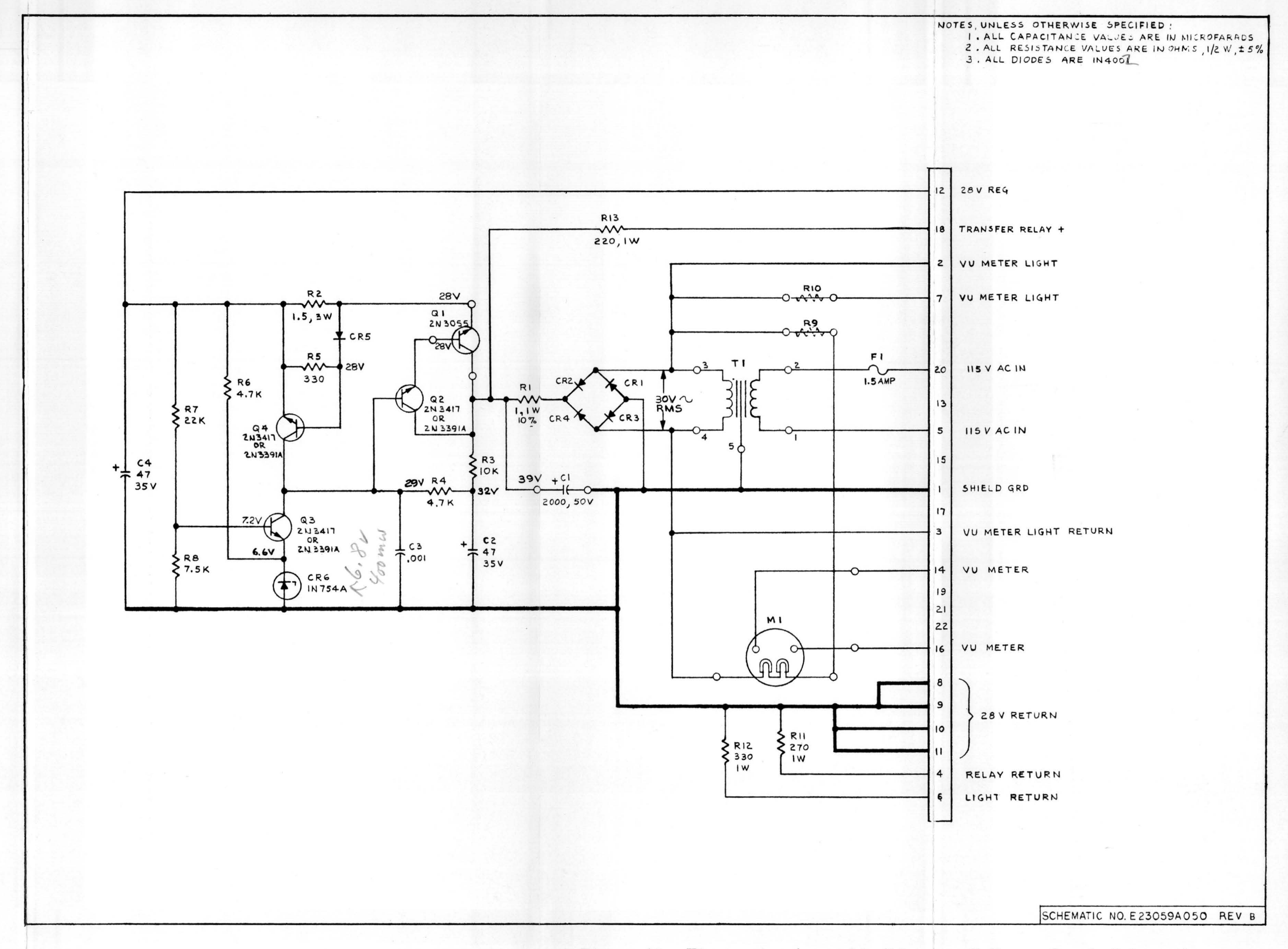



Figure 40. Electronics Assembly (Meter and) Power Supply Schematic

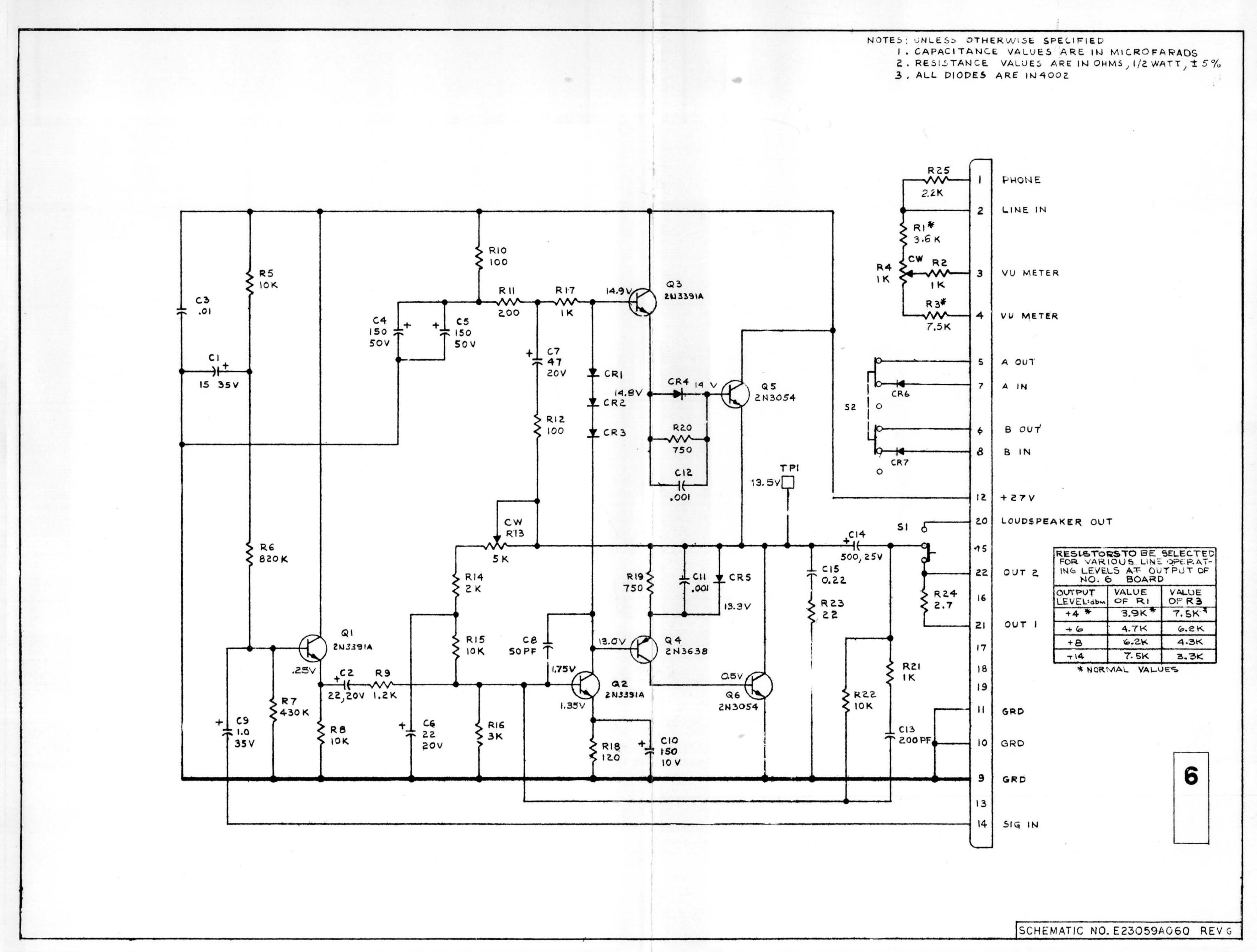



Figure 41. Line Driver Amplifier Schematic

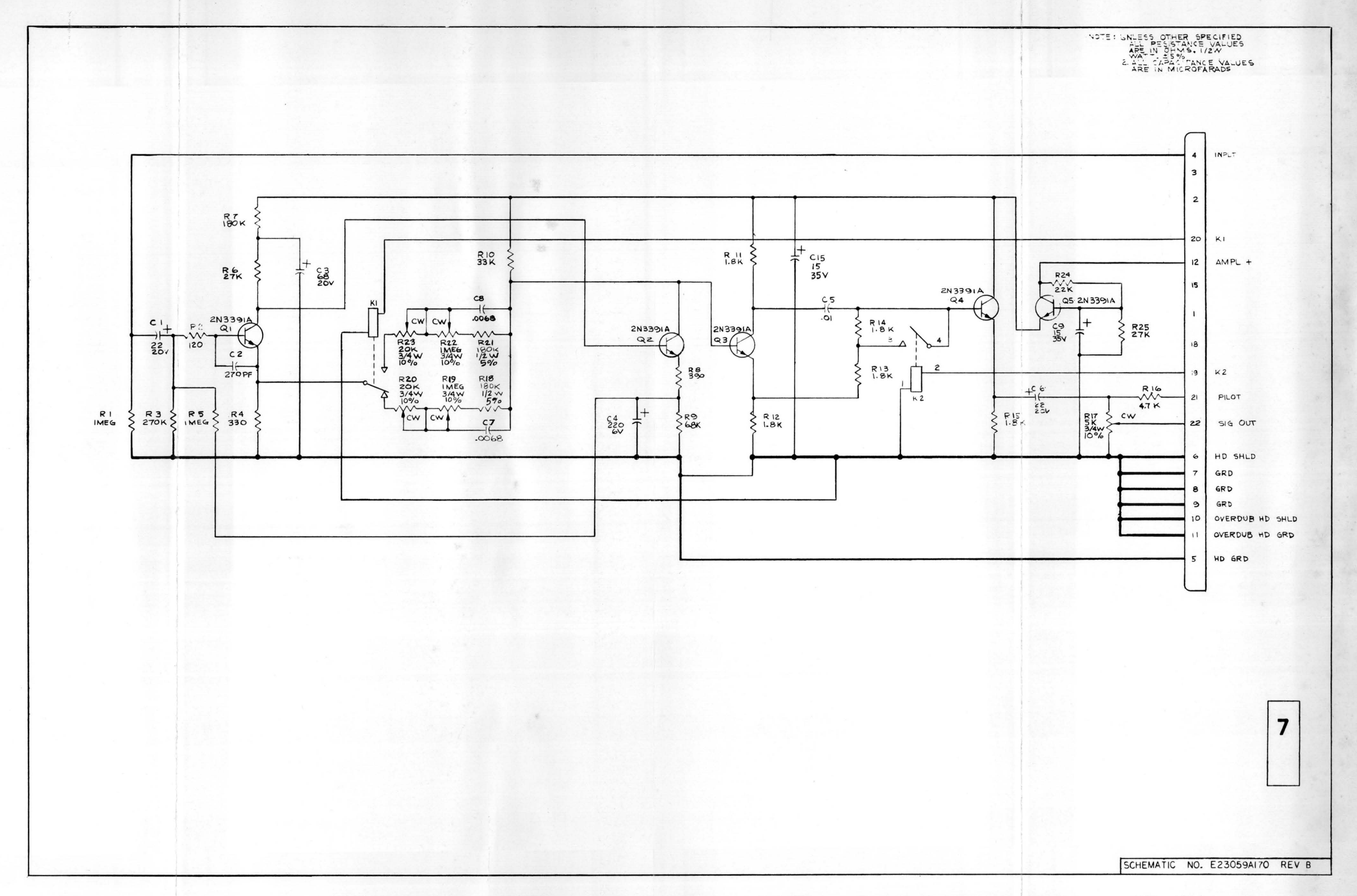



Figure 42. H and NAB Reproduce Preamplifier Schematic

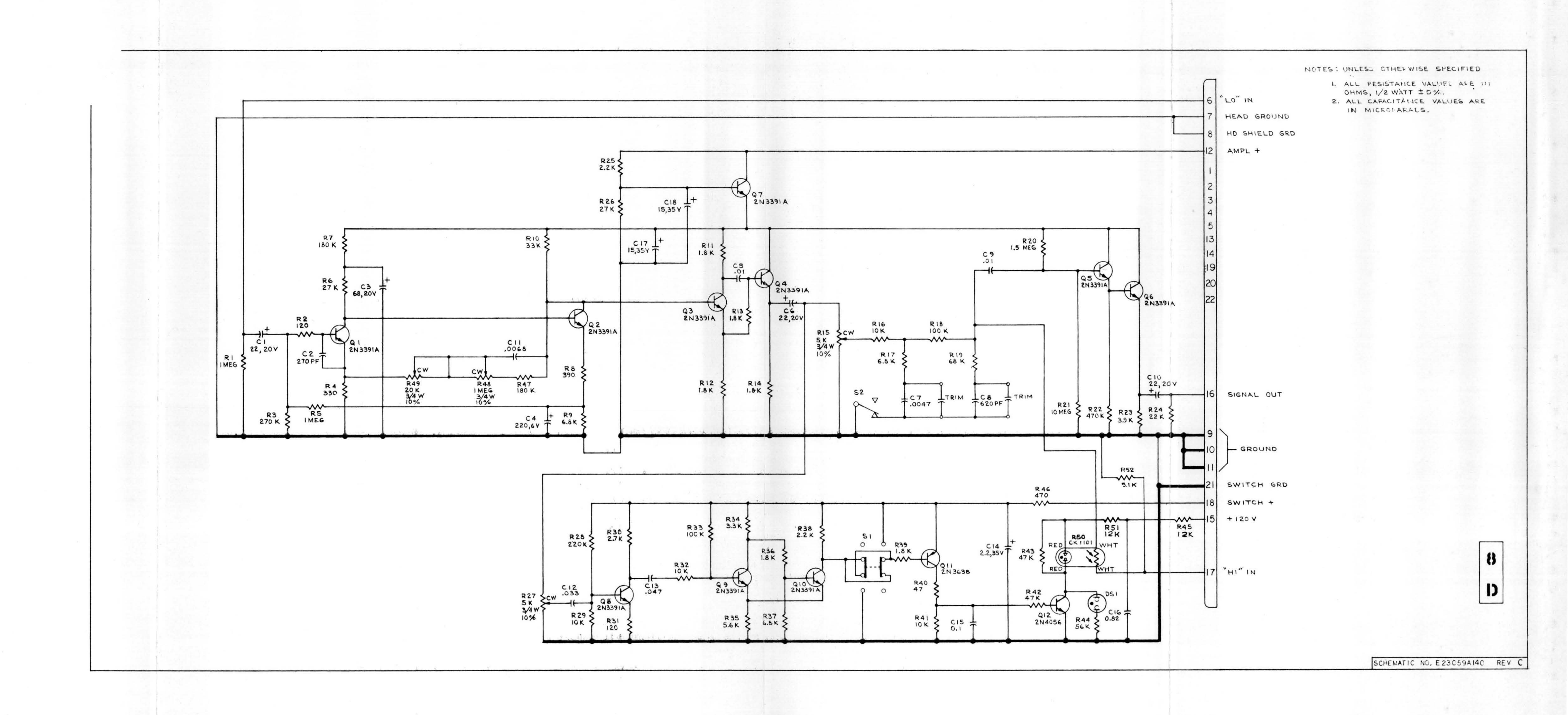
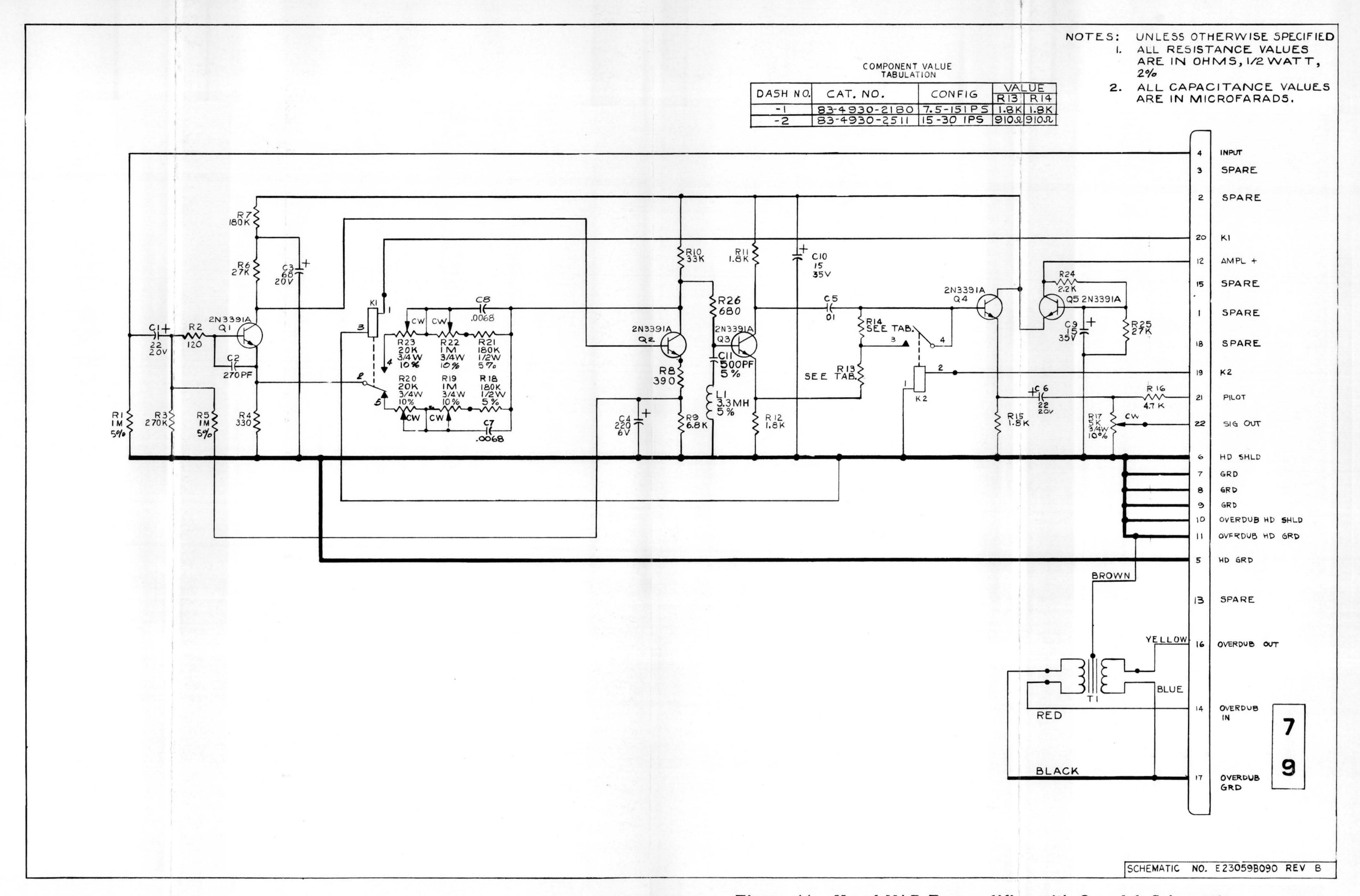



Figure 43. Dynatrack L Preamplifier and Switch Schematic




| DASH NO. | CAT. NO. | CONFIG | VALUE R13 | VALUE R14 |
|---|---|---|---|---|
| -1 | 83-4930-2180 | 7.5-15IPS | 1.8K | 1.8K |
| -2 | 83-4930-2511 | 15-30 IPS | 910Ω | 910Ω |

**Figure 44. H and NAB Preamplifier with Overdub Schematic**

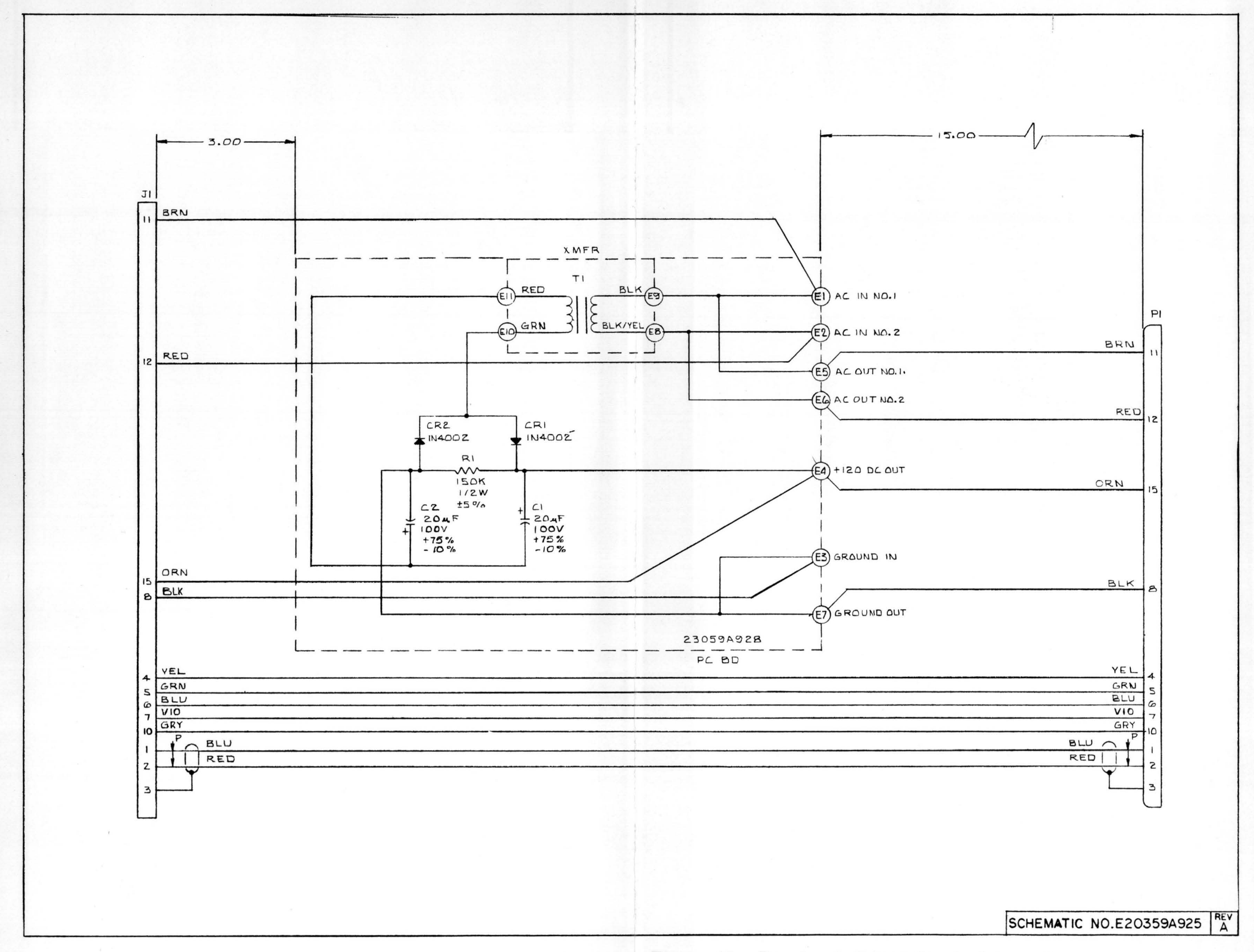



Figure 45. Dynatrack Power Supply Schematic

# PARTS LISTS

## INTRODUCTION

This section contains parts lists for the 3M Brand Professional Audio Recorder. Drawings for mechanical assemblies are included to aid in parts identification. Electrical parts are identified by reference designators on the assemblies of which they are a part.

The parts list are arranged in alphanumerical order according to their part number which is in the upper right corner. When an assembly drawing is included, it follows immediately after the parts list. The parts list and drawing numbers are the same for all assemblies with one exception: parts list 23013B990 is for drawing 23013B000.

## ORDERING REPLACEMENT PARTS

Parts should be ordered through one of the Mincom Division service offices listed below. 3M recommends that whenever possible, and particularly when an instrument is used in a critical application, the user maintains a minimum stock of spare parts. The Mincom Division has specialized personnel ready to assist the user in making a selection of spares. Any additional information required can be obtained by contacting the service offices listed below.

| | |
|---|---|
| Western U. S. | 3M Company<br>Mincom Division<br>300 South Lewis Road<br>Camarillo, California 93010<br>(805) 482-1911 |
| Eastern U. S. | 3M Company<br>Mincom Division<br>1750 Pennsylvania Avenue<br>Suite 1100<br>Washington, D. C. 20006<br>(202) 298-9200 |

When ordering parts the following information should always be supplied:

1. A description of the part, obtained from the parts list.
2. The 3M catalog number.
3. The manufacturer's part number.
4. The schematic reference designator, if applicable, given on the applicable schematic and on the parts list.

5. The part or type number of the major assembly as shown on the name plate, and the serial number of that assembly.

6. The 3M sales order number applying to the complete system or order

The following table lists each of the parts lists included in this manual. To locate a parts list, determine the part number or assembly name and locate it in the following table. The referenced page number may then be used to find the parts list.

Table 11. Parts List Index

Table 11. Parts List Index (Cont'd)

| Part No. | Description | Catalog No. | Page No. |
|---|---|---|---|
| 23007A030-2 | Tape Transport Head Cover, Door Assembly | 83-4330-0271 | 205 |
| 23007A050-1 | Right Hand Actuating Idler Arm Assembly | 83-4210-0232 | 206 |
| 23007A050-2 | Left Hand Actuating Idler Arm Assembly | 83-4210-0256 | 207 |
| 23007A060-1 | 1/2" Tape Transport Capstan Assembly | 83-5920-0819 | 208 |
| 23007A060-2 | Tape Transport Capstan Assembly | 83-5920-0833 | 209 |
| 23007A070 | Capstan Drive Motor Mounting Bracket Assy | 83-4320-1476 | 210 |
| 23007C410-1 | 30 - 60 IPS Capstan Motor Assembly | 83-4560-0152 | 211 |
| 23007C410-2 | 60 - 120 IPS Capstan Motor Assembly | 83-4560-0153 | 212 |
| 23009A000 | Transport Electronics Power Supply Assy | 83-5920-0820 | 213 |
| 23010A910 | Edit Switch Assembly Kit | 83-5990-0839 | 214 |
| 23012A000 | Vernier Speed Adjust Bracket Assembly | 83-4930-1002 | 215 |
| 23013B000 | All Versions Tape Deck Assembly | 83-5920-1344 | 216 |
| 23013A030 | Transport Distribution Panel Assembly | 83-4930-1003 | 217 |
| 23013B030 | Transport Distribution Panel Assembly | 83-4930-1685 | 218 |
| 23013A040-1 | Transport Tape Lifter Arm Assembly | 83-4210-0206 | 219 |
| 23013A040-2 | Tape Lifter Arm Assembly, 1" Tape | 83-4210-0242 | 220 |
| 23013B050 | Harness Assembly, Tape Transport | 83-4570-0459 | 221 |
| 23013B060 | Bias Osc. and Logic Circuit Board Assy | 83-4930-1716 | 223 |
| 23013A070 | Incoming Sensor Printed Circuit Board Assy | 83-4930-1046 | 225 |
| 23013B075 | Printed Circuit Board Assembly, Outgoing Tape Sensor | 83-4930-1691 | 226 |
| 23013B080 | Chassis Assembly, Transport Wrap Around | 83-5920-1332 | 227 |
| 23013A090-1 | Left Hand Roller Idler Arm Assembly | 83-4210-0230 | 228 |
| 23013A090-2 | Right Hand Roller Idler Arm Assembly | 83-4210-0231 | 229 |
| 23013A095 | Head Cover Door Actuator Arm Assembly | 83-4210-0237 | 230 |
| 23013A125-1 | Tape Guide Assembly, Preplay | 83-3240-0440 | 231 |
| 23013A125-2 | Preplay Tape Guide Assembly, 1/2" | 83-3240-0442 | 232 |
| 23013A125-3 | Preplay Tape Guide Assembly, 1" | 83-3240-0443 | 233 |
| 23013A160 | Reel Hub Assembly, 1/4" Tape | 83-4930-1884 | 234 |
| 23013A900 | Capstan Area Parts Kit, 1/2" | 83-5990-0426 | 235 |
| 23013A905 | Capstan Area Parts Kit, 1" | 83-5990-0427 | 236 |
| 23013A910 | Capstan Tape Guide Kit, 1/2", 1/4" | 83-5990-0428 | 237 |
| 23013A915 | Capstan Tape Guide Kit, 1/2", 1/2" | 83-5990-0429 | 238 |
| 23013B920 | Capstan Tape Guide Kit, 1" | 83-5990-0558 | 239 |
| 23013A930 | Capstan Tape Guide Kit, 1/4", 1" | 83-5990-0431 | 240 |
| 23013A935 | Capstan Tape Guide Kit, 1/2", 1" | 83-5990-0432 | 241 |
| 23013B940 | Speed Kit, 3 3/4 - 7 1/2 IPS | 83-5990-0559 | 242 |
| 23013B945-1 | Speed Kit, 7 1/2 - 15 IPS | 83-5990-0560 | 243 |
| 23013B945-2 | Speed Kit, 50 Cycle 7 1/2 - 15 IPS | 83-5990-0582 | 244 |
| 23013B950-1 | Speed Kit, 15 - 30 IPS | 83-5990-0561 | 245 |
| 23013B950-2 | Speed Kit, 50 Cycle 15 - 30 IPS | 83-5990-0581 | 246 |
| 23013B955 | Speed Kit, 30 - 60 IPS | 83-5990-0562 | 247 |
| 23013B960 | Speed Kit, 60 - 120 IPS | 83-5990-0563 | 248 |

Table 11. Parts List Index (Cont'd)

| Part No. | Description | Catalog No. | Page No. |
|---|---|---|---|
| 23013A970 | Brake Kit, High Speed Capstan | 83-5990-0438 | 249 |
| 23013A986 | 1/4" Cine Reel Hub Base | 83-3240-0455 | 250 |
| 23013B990 | Tape Deck Common Parts Kit | 83-5990-0564 | 251 |
| 23017A000 | Optional Remote Control Assembly | 83-5920-0823 | 256 |
| 23017A010 | Cable Assembly, Remote Control External | 83-4570-0428 | 259 |
| 23017A100 | Sync Remote Control Assembly | 83-5920-1493 | 260 |
| 23028A020 | Basic Cabinet Console Assembly | 83-4310-0998 | 262 |
| 23028A050 | Cable Assembly, 36" 4 Track Power | 83-4570-0346 | 263 |
| 23028A055 | Cable Assembly, 66" 4 Track Power | 83-4570-0380 | 264 |
| 23028A060 | Cable Assembly, 36" 8 Track Power | 83-4570-0347 | 265 |
| 23028A065 | Cable Assembly, 66" 8 Track Power | 83-4570-0381 | 266 |
| 23028A070 | Meter Display Assembly, 4 Bay | 83-5920-1126 | 267 |
| 23028A075 | Harness Assembly, Remote Meter | 83-4570-0387 | 268 |
| 23028A080 | Housing Assembly, 4 Track Signal Electronics | 83-4310-1000 | 269 |
| 23028A085 | Cover Assembly, Display Panel | 83-3310-1157 | 270 |
| 23028A090 | Housing Assembly, 2 Track Signal Electronics | 83-4310-0999 | 271 |
| 23028A250 | Cable Assembly, Reproducer Power | 83-4570-0420 | 272 |
| 23028A350 | Cable Assembly, Film Sync Power | 83-4570-0466 | 273 |
| 23059A010 | Housing Assembly, Signal Electronics Audio | 83-5920-0842 | 274 |
| 23059A020 | Bias Erase Printed Circuit Board Assy | 83-4930-1121 | 281 |
| 23059A030 | NAB Erase Coupler Printed Circuit Board Assembly | 83-4930-1117 | 283 |
| 23059B040 | NAB Record Printed Circuit Board Assy | 83-4930-1214 | 284 |
| 23059A050 | Signal Electronics Power Supply Assembly W/Meter | 83-5920-0822 | 286 |
| 23059A055 | Signal Electronics Power Supply Printed Circuit Board Assembly | 83-4930-1014 | 289 |
| 23059A060 | Signal Electronics Line Amplifier Printed Circuit Board Assembly | 83-4930-1091 | 290 |
| 23059B090-1 | Overdub Preamplifier Printed Circuit Board Assembly | 83-4930-2180 | 292 |
| 23059B090-2 | Overdub Preamplifier Printed Circuit Board Assembly | 83-4930-2511 | 293 |
| 23059A110 | Extender Printed Circuit Board Assembly | 83-4930-1746 | 295 |
| 23059A130 | Record Dynatrack Printed Circuit Board Assembly | 83-4930-1006 | 296 |
| 23059A140 | Reproduce Dynatrack Printed Circuit Board Assembly | 83-4930-1964 | 298 |
| 23059A170 | Reproduce NAB Preamplifier Printed Circuit Board Assembly | 83-4930-1940 | 301 |

Table 11. Parts List Index (Concluded)

P A R T S L I S T PL 23000B000 REV E

TITLE TAPE RECORDER ASSY-PROF AUDIO CATALOG NO. 83-5990-0565

- - - - - - - - - - - - - - - - - M A T E R I A L R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23000A940 | A MINCOM | KIT-COVER & TRIM, NARROW | 83-5990-0440 | AR |
| 2 | 23000A970 | C MINCOM | KIT-TILTING, TRANSPORT | 83-5990-0580 | AR |
| 5 | 23028A100-1 | MINCOM | CASE ASSY-CARRYING,3 TK MOD 23 | 83-4130-0069 | AR |
| 6 | 23028A100-2 | B MINCOM | CASE ASSY-CARRYING,4 TK ELECT | 83-4130-0070 | AR |
| 10 | 23028A046 | MINCOM | PANEL-BLANK, CABINET,5.218 WD | 83-3360-1101 | AR |
| 11 | 23028A020 | E MINCOM | CONSOLE ASSY-CAB, BASIC | 83-4310-0998 | AR |
| 12 | 23028A090 | C MINCOM | HOUSING ASSY-SIGNAL ELEC, 2TRK | 83-4310-0999 | AR |
| 13 | 23028A080 | C MINCOM | HOUSING ASSY-SIGNAL ELEC 4TRK | 83-4310-1000 | AR |
| 14 | 23028A070 | D MINCOM | DISPLAY ASSY-METER, 4 BAY | 83-5920-1126 | AR |
| 15 | 23000A902 | C MINCOM | KIT-INSTALLATION,MTG,ELECT | 83-5990-0416 | AR |
| 20 | 23059A000 | C MINCOM | SIG ELEC ASSY-MOD 23,NAB | 83-5920-0944 | AR |
| 21 | 23059A920 | B MINCOM | KIT-P.C.BD,NAB TO DYNATRACK | 83-5990-0425 | AR |
| 22 | 23059A170 | B MINCOM | P.C.BD ASSY-PREAMP,NAB,REPRO | 83-4930-1940 | AR |
| 24 | 23059A950 | B MINCOM | KIT-FILM SYNC, SIG ELEC | 83-5990-0541 | AR |
| 26 | 23059A960-1 | B MINCOM | KIT-NAB REPRO,SIG ELEC, 4 TRK | 83-5990-0566 | AR |
| 27 | 23059A960-2 | B MINCOM | KIT-NAB REPRO,SIG ELEC, 8 TRK | 83-5990-0567 | AR |
| 28 | 23059A140 | C MINCOM | P.C.BD ASSY-DYNATRACK,REPRO | 83-4930-1964 | AR |
| 29 | BX28N2.5-2 | ACDC ELECTS | POWER SUPPLY-28VOLTS 2.5 AMPS | 83-1930-1672 | AR |
| 35 | 23028A050 | B MINCOM | CABLE ASSY-PWR,4TRK,36 IN | 83-4570-0346 | AR |
| 36 | 23028A060 | C MINCOM | CABLE ASSY-PWR,8 TRK,36 IN | 83-4570-0347 | AR |
| 37 | 23028A055 | B MINCOM | CABLE ASSY-PWR,4 TRK,66 IN | 83-4570-0380 | AR |
| 38 | 23028A065 | B MINCOM | CABLE ASSY-PWR,8 TRK,66 | 83-4570-0381 | AR |
| 40 | 23000A015 | MINCOM | CABLE ASSY-INTERCONN,HDS | 83-4570-0345 | AR |
| 41 | 23000A010-1 | MINCOM | CABLE ASSY-INTERCONN,HD,1 TRK | 83-4570-0382 | AR |
| 42 | 23000A010-2 | MINCOM | CABLE ASSY-INTERCONN,HDS,2 TRK | 83-4570-0383 | AR |
| 43 | 23000A010-3 | MINCOM | CABLE ASSY-INTERCONN,HDS,3 TRK | 83-4570-0384 | AR |
| 44 | 23000A010-4 | MINCOM | CABLE ASSY-INTERCONN,HDS,4 TRK | 83-4570-0385 | AR |
| 45 | 23000A010-8 | MINCOM | CABLE ASSY-INTERCONN,HDS,8 TRK | 83-4570-0386 | AR |
| 50 | 23000A960-1 | B MINCOM | KIT-HD MTG PLATE/CONN,1/2 IN | 83-5990-0474 | AR |
| 51 | 23000A960-2 | B MINCOM | KIT-HD MTG PLATE/CONN, 1 IN | 83-5990-0475 | AR |
| 53 | 23000B020-1 | C MINCOM | HD SET ASSY-REC/REP/ERASE,1 TK | 83-5950-1227 | AR |
| 54 | 23000B020-2 | C MINCOM | HD SET ASSY-REC/REP/ERASE,2 TK | 83-5950-1228 | AR |
| 55 | 23000B020-5 | C MINCOM | HD SET ASSY-REC/REP/ERASE,2 TK | 83-5950-1231 | AR |
| 56 | 23000B020-3 | C MINCOM | HD SET ASSY-REC/REP/ERASE,3 TK | 83-5950-1229 | AR |
| 57 | 23000B020-4 | C MINCOM | HD SET ASSY-REC/REP/ERASE,4 TK | 83-5950-1230 | AR |
| 59 | 23000B020-7 | C MINCOM | HD SET ASSY-REC/REP/ERASE,4 TK | 83-5950-1233 | AR |
| 61 | 23000B020-9 | C MINCOM | HD SET ASSY-REC/REP/ERASE,8 TK | 83-5950-1235 | AR |
| 62 | 23000A040-1 | C MINCOM | HD-MTG ASSY 4TK REP ONLY | 83-5950-1162 | AR |
| 63 | 23000A040-2 | C MINCOM | HD-MTG ASSY 8TK REP ONLY | 83-5950-1163 | AR |
| 70 | 23017A000 | B MINCOM | CONTROL ASSY-REMOTE,OPTIONAL | 83-5920-0823 | AR |
| 71 | 23017A010 | A MINCOM | CABLE ASSY-EXT,REMOTE CONTROL | 83-4570-0428 | AR |
| 72 | 23000A950 | D MINCOM | SW ASSY-TAPE EDITING,FT OPER | 83-4550-5298 | AR |

PAGE NO. 2 P A R T S L I S T PL 23000B000 REV E

TITLE TAPE RECORDER ASSY-PROF AUDIO CATALOG NO. 83-5990-0565

- - - - - - - - - - - - - - - - M A T E R I A L R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 75 | 23013A122-1 | A | MINCOM | COVER-TAPE DECK,10 1/2 REEL | 83-3310-1137 | AR |
| 76 | 23013A122-2 | A | MINCOM | COVER-TAPE DECK,12 REEL | 83-3310-1138 | AR |
| 77 | 23013A121 | A | MINCOM | COVER-TAPE DECK,PORTABLE | 83-3310-1139 | AR |
| 78 | 23013A120-1 | A | MINCOM | COVER-IDLER,PREPLAY,1/4&1/2 IN | 83-3310-1131 | AR |
| 79 | 23013A120-2 | A | MINCOM | COVER-IDLER,PREPLAY, 1.00 INCH | 83-3310-1156 | AR |
| 80 | 23000A900-1 | B | MINCOM | KIT ACCESSORY,PREPLAY HEAD | 83-5990-0267 | AR |
| 81 | 23000A900-2 | B | MINCOM | KIT-ACCESS,PREPLAY HD,2 TRK1/4 | 83-5990-0568 | AR |
| 82 | 23059A960-2 | B | MINCOM | KIT-NAB REPRO,SIG ELEC, 8 TRK | 83-5990-0567 | AR |
| 83 | 23000A900-4 | B | MINCOM | KIT-ACCESS,PREPLAY HD,3 TRK1/2 | 83-5990-0570 | AR |
| 84 | 23000A900-5 | B | MINCOM | KIT-ACCESS,PREPLAY HD,4 TRK1/2 | 83-5990-0571 | AR |
| 85 | 23000A900-6 | B | MINCOM | KIT-ACCESS,PREPLAY HD,4 TRK 1 | 83-5990-0572 | AR |
| 86 | 23000A900-7 | B | MINCOM | KIT-ACCESS,PREPLAY HD,8 TRK 1 | 83-5990-0573 | AR |
| 100 | 23013B000 | D | MINCOM | TAPE DECK ASSY-ALL VERSIONS | 83-5920-1344 | AR |
| 101 | 23013A986 | A | MINCOM | BASE-REEL HUB,1/4 CINE TOP HAT | 83-3240-0455 | AR |
| 102 | 23013A901 | A | MINCOM | KIT-AUTO REWIND OR STOP,SENSOR | 83-5990-0669 | AR |
| 103 | 23017A100 | B | MINCOM | CONTROL ASSY-REMOTE,SYNC | 83-5920-1493 | AR |
| 104 | 23017A110 | A | MINCOM | CABLE ASSY-ADAPTER REMOTE SYNC | 83-4570-0585 | AR |
| 105 | 23059A905 | A | MINCOM | KIT-REMOTE SYNC,SIGNAL ELECT | 83-5990-0714 | AR |
| 106 | 23013A700 | A | MINCOM | TAPE DECK ASSY-MOD 23,150 MIL | 83-5920-1587 | AR |
| 107 | 23010A910 | A | MINCOM | KIT-EDIT, SWITCH ASSY | 83-5990-0839 | AR |
| 108 | 2300A990 | | MINCOM | KIT-ACCESS,BASIC, MODEL 23 | 83-5990-0868 | 1.0 |

PARTS LIST PL 23000A010-8 REV

TITLE CABLE ASSY-INTERCONN,HDS,8 TRK CATALOG NO. 83-4570-0386

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|---|
| 1 | MRAC-25-G7 | | WINCHESTER | | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| 2 | 100-2022S | | WINCHESTER | | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 2.0 |
| 3 | 23000A011 | B | MINCOM | | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 4 | 00000A499-57 | | LLOYD WEST | C | MARKER-IDENT,CABLE,UNMARKED | 83-3550-1271 | 24.0 |
| 5 | 23000A015 | | MINCOM | | CABLE ASSY-INTERCONN,HDS | 83-4570-0345 | 8.0 |
| 6 | | | NATL WIRE | | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 7 | TYPE YQE-91 | | BURNDY | | SPLICE-ELECTRICAL CONDUCTOR | 83-9630-0470 | 2.0 |

PARTS LIST PL 23000A015 REV

TITLE CABLE ASSY-INTERCONN,HDS CATALOG NO. 83-4570-0345

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 3106A10SL-3S | CANNON | CONN-PLUG,ELEC,STR, 3 SOC | 83-1610-0595 | 3.0 |
| 2 | 100-2022S | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 5.0 |
| 3 | AN-3057-4 | AMPHENOL | CLAMP-ELEC,STRAIN RELIEF,10,12 | 83-1650-0127 | 3.0 |
| 4 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 5 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 6 | 202-3932 | MICRODOT | WIRE-SHIELDED, TWIST. PAIR | 83-7910-0420 | AR |
| 7 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 1.0 |
| 8 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 3.0 |
| 9 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 3.0 |

PARTS LIST PL 23000A030-1 REV

TITLE CABLE ASSY-HD,REPRODUCE,4 TRK CATALOG NO. 83-4570-0389

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 3106A10SL-3S | CANNON | CONN-PLUG,ELEC,STR, 3 SOC | 83-1610-0595 | 4.0 |
| 2 | MRAC-25-G7 | WINCHESTER | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| 3 | 100-2022S | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 8.0 |
| 4 | AN-3057-4 | AMPHENOL | CLAMP-ELEC,STRAIN RELIEF,10,12 | 83-1650-0127 | 4.0 |
| 5 | 23000A011 B | MINCOM | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 6 | 00000A499-57 | LLOYD WEST C | MARKER-IDENT,CABLE,UNMARKED | 83-3550-1271 | 4.0 |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | 202-3932 | MICRODOT | WIRE-SHIELDED, TWIST. PAIR | 83-7910-0420 | AR |
| 9 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 1.0 |
| 10 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 4.0 |
| 11 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 4.0 |

P A R T S   L I S T                PL 23000A030-2     REV

TITLE  CABLE ASSY-HD,REPRODUCE,8 TRK          CATALOG NO. 83-4570-0390

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| | 202-3932 | MICRODOT | WIRE-SHIELDED, TWIST. PAIR | 83-7910-0420 | AR |
| 1 | 3106A10SL-3S | CANNON | CONN-PLUG,ELEC,STR, 3 SOC | 83-1610-0595 | 8.0 |
| 2 | MRAC-25-G7 | WINCHESTER | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| 3 | 100-2022S | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 16.0 |
| 4 | AN-3057-4 | AMPHENOL | CLAMP-ELEC,STRAIN RELIEF,10,12 | 83-1650-0127 | 8.0 |
| 5 | 23000A011 B | MINCOM | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 6 | 00000A499-57 | LLOYD WEST C | MARKER-IDENT,CABLE,UNMARKED | 83-3550-1271 | 8.0 |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | 2.0 |
| 8 | 202-3932 | MICRODOT | WIRE-SHIELDED, TWIST. PAIR | 83-7910-0420 | 48.0 |
| 9 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 2.0 |
| 10 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 8.0 |
| 11 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 8.0 |

PARTS LIST PL 23000A310 REV A

TITLE CABLE ASSY-HEAD, FILM SYNC CATALOG NO. 83-4570-0465

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| J1 | MRAC-25-G7 | WINCHESTER | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| P104,P105,P106,P107,P108 | 3106A10SL-3S | CANNON | CONN-PLUG,ELEC,STR, . 3 SOC | 83-1610-0595 | 5.0 |
| 1 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 5.0 |
| 2 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 5.0 |
| 3 | 100-2022S | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 11.0 |
| 4 | AN-3057-4 | AMPHENOL | CLAMP-ELEC,STRAIN RELIEF,10,12 | 83-1650-0127 | 5.0 |
| 5 | 23000A011 B | MINCOM | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 6 | 00000A499-57 | LLOYD WEST C | MARKER-IDENT,CABLE,UNMARKED | 83-3550-1271 | 5.0 |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 9 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 10 | 202-3932 | MICRODOT | WIRE-SHIELDED, TWIST. PAIR | 83-7910-0420 | AR |
| 11 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 3.0 |
| 12 | TYPE YQE-91 | BURNDY | SPLICE-ELECTRICAL CONDUCTOR | 83-9630-0470 | 1.0 |
| 13 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |

PARTS LIST PL 23000A900-1 REV B

TITLE KIT ACCESSORY,PREPLAY HEAD CATALOG NO. 83-5990-0267

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-1 | | MINCOM | DOOR-PREPLAY HD | 83-3330-0339 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-1 | A | MINCOM | SHIELD-HEAD,PREPLAY,1.25 LG | 83-3650-0475 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-1 | C | MINCOM | HD-ASSY 1TK REP AUDIO 1/4 IN | 83-5950-0994 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-1 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY | 83-3240-0440 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

PARTS LIST PL 23000A900-2 REV B

TITLE KIT-ACCESS,PREPLAY HD,2 TRK1/4 CATALOG NO. 83-5990-0568

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-1 | | MINCOM | DOOR-PREPLAY HD | 83-3330-0339 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-1 | A | MINCOM | SHIELD-HEAD,PREPLAY,1.25 LG | 83-3650-0475 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-2 | C | MINCOM | HD-ASSY 2TK REP AUDIO 1/4 IN | 83-5950-0999 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-1 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY | 83-3240-0440 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 2.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

PARTS LIST PL 23000A900-3 REV B

TITLE KIT-ACCESS,PREPLAY HD,2 TRK1/2 CATALOG NO. 83-5990-0569

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-1 | | MINCOM | DOOR-PREPLAY HD | 83-3330-0339 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-1 | A | MINCOM | SHIELD-HEAD,PREPLAY,1.25 LG | 83-3650-0475 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-5 | C | MINCOM | HD-ASSY 2TK REP AUDIO 1/2 IN | 83-5950-1008 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-2 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY,1/2 IN | 83-3240-0442 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

P A R T S  L I S T — PL 23000A900-4 — REV B

TITLE KIT-ACCESS,PREPLAY HD,3 TRK1/2 — CATALOG NO. 83-5990-0570

---------------- M A T E R I A L  R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-1 | | MINCOM | DOOR-PREPLAY HD | 83-3330-0339 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-1 | A | MINCOM | SHIELD-HEAD,PREPLAY,1.25 LG | 83-3650-0475 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-3 | C | MINCOM | HD-ASSY 3TK REP AUDIO 1/2 IN | 83-5950-1000 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-2 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY,1/2 IN | 83-3240-0442 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

P A R T S   L I S T          PL 23000A900-5     REV B

TITLE  KIT-ACCESS,PREPLAY HD,4 TRK1/2          CATALOG NO. 83-5990-0571

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-1 | | MINCOM | DOOR-PREPLAY HD | 83-3330-0339 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-1 | A | MINCOM | SHIELD-HEAD,PREPLAY,1.25 LG | 83-3650-0475 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-4 | C | MINCOM | HD-ASSY 4TK REP AUDIO 1/2 IN | 83-5950-1001 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-2 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY,1/2 IN | 83-3240-0442 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

P A R T S  L I S T    PL 23000A900-6    REV B

TITLE KIT-ACCESS,PREPLAY HD,4 TRK 1    CATALOG NO. 83-5990-0572

- - - - - - - - - - - - - - - - - M A T E R I A L  R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-2 | D | MINCOM | DOOR-PREPLAY HD | 83-3330-0340 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-2 | A | | SHIELD-HEAD,PREPLAY,1.75 LG | 83-3650-0476 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-7 | C | MINCOM | HD-ASSY 4TK REP AUDIO 1 IN | 83-5950-1114 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-3 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY,1 INCH | 83-3240-0443 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

PARTS LIST PL 23000A900-7 REV B

TITLE KIT-ACCESS,PREPLAY HD,8 TRK 1 CATALOG NO. 83-5990-0573

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23013A113-2 | D | MINCOM | DOOR-PREPLAY HD | 83-3330-0340 | 1.0 |
| 3 | 23013A118 | | MINCOM | SUPPORT-DOOR, PREPLAY | 83-3340-0592 | 1.0 |
| 4 | 23013A115 | | MINCOM | SHAFT-HINGE, PREPLAY | 83-3280-0610 | 1.0 |
| 5 | 23013A116 | | MINCOM | SPACER-AZMUTH ADJ, PREPLAY | 83-3350-0535 | 1.0 |
| 6 | 23013A114 | | MINCOM | SUPPORT-COVER, PRE PLAY | 83-3340-0591 | 2.0 |
| 7 | 23013A112 | | MINCOM | COVER-DECORAIVE,PREPLAY | 83-3310-1129 | 1.0 |
| 8 | 23013A119-2 | A | | SHIELD-HEAD,PREPLAY,1.75 LG | 83-3650-0476 | 1.0 |
| 9 | 23002A003-2 | B | MINCOM | SHOE-HEAD, REPRODUCE | 83-3950-1103 | 1.0 |
| 10 | 23002A200-9 | C | MINCOM | HD-ASSY 8TK REP AUDIO 1 IN | 83-5950-1116 | 1.0 |
| 11 | 23000A905 | A | MINCOM | MOUNT ASSY-REPRODUCE HD,PREPLY | 83-4320-1751 | 1.0 |
| 12 | 23013A125-3 | A | MINCOM | TAPE GUIDE ASSY-PREPLAY,1 INCH | 83-3240-0443 | 1.0 |
| 16 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |
| 17 | MS24693-S2 | | MIL STD | SCREW-MACH,FH,4-40 X 1/4 | 83-9260-6554 | 2.0 |
| 18 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 1.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 21 | MS35207-260 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 5/16 | 83-9260-4569 | 1.0 |
| 22 | MS35206-204 | | MIL STD | SCREW-MACH,PAN HD,2-56 X 5/16 | 83-9260-4503 | 2.0 |
| 23 | MS35206-213 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 24 | | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 4.0 |
| 25 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 26 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 27 | MS35338-39 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 28 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 29 | | | | WASHER-FLAT,RD,.125 I.D. | 83-9261-4062 | 2.0 |
| 30 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 1.0 |
| 31 | 23002A002 | | MINCOM | SHIELD-BASE, HEAD, REPRODUCE | 83-3950-1104 | 1.0 |

PARTS LIST PL 23000A902 REV C

TITLE KIT-INSTALLATION,MTG,ELECT CATALOG NO. 83-5990-0416

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23028A033-1 | A MINCOM | BRKT-MTG, LH, SIGNAL ELECT | 83-3320-1121 | 1.0 |
| 2 | 23028A033-2 | A MINCOM | BRKT-MTG, RH, SIGNAL ELECT | 83-3320-1122 | 1.0 |
| 3 | 23028A023 | C MINCOM | STOP-BAR,DOOR,CABINET,CONSOLE | 83-3350-0389 | 1.0 |
| 5 | A6732-5-02 | ESNA | NUT-NON LKG,PL,10-32 | 83-9260-0059 | 16.0 |
| 6 | | | SCREW-WOOD, RD HD,#6 X 7/8 | 83-9262-0555 | 4.0 |
| 7 | | | SCREW-WOOD, RD HD,#10 X 1.00LG | 83-9262-0559 | 8.0 |
| 8 | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 4.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 8.0 |

P A R T S   L I S T          PL 23000A905          REV A

TITLE  MOUNT ASSY-REPRODUCE HD,PREPLY          CATALOG NO. 83-4320-1751

---------------- M A T E R I A L   R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23013A111 | | MINCOM | BASE-MOUNTING-PRE PLAY | 83-3240-0439 | 1.0 |
| 2 | 23001A012 | C | MINCOM | MTG-PLATE REPRO HD AZIMUTH | 83-3950-0962 | 1.0 |
| 3 | MS35190-222 | | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 2.0 |

PARTS LIST    PL 23000A940    REV A

TITLE KIT-COVER & TRIM, NARROW    CATALOG NO. 83-5990-0440

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 251 | 23013A020 | A MINCOM | COVER-SWITCH,TAPE METERING | 20 | 83-3310-0838 | 1.0 |
| 252 | 23013A023-1 | E MINCOM | COVER-TAPE DECK,10 1/2 IN REEL | 20 | 83-3310-0850 | 1.0 |
| 253 | 23013A021 | A MINCOM | PLATE-MASKING,SWTCH,TAPE TRANS | 20 | 83-3320-1117 | 1.0 |
| 254 | 23013A022-1 | D MINCOM | PLATE-MASKING,SWTCH,TAPE TRANS | 20 | 83-3320-1118 | 1.0 |
| 255 | 23013A018-1 | D MINCOM | TRIM-SWITCH PANEL,LH,TRANSPORT | 20 | 83-3330-0243 | 1.0 |
| 256 | 23013A018-2 | D MINCOM | TRIM-SWITCH PANEL,RH,TRANSPORT | 20 | 83-3330-0244 | 1.0 |
| 257 | 23013A024 | A MINCOM | TRIM-CHANNEL,TAPE DECK | 20 | 83-3330-0245 | 2.0 |
| 258 | MS24693-S24 | MIL STD | SCREW-MACH,FH,6-32 X .250 100 | 20 | 83-9260-6571 | 10.0 |

PARTS LIST PL 23000A950 REV D

TITLE SW ASSY-TAPE EDITING,FT OPER CATALOG NO. 83-4550-5298

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C1 | BR500-25 | | CORNELL DUBL | CAP-FXD,ELECT, 500UF 25V | 83-1510-2044 | 1.0 |
| CR1 | 1N4004 | | MOTOROLA | RECT -SI,DIF JCT,400PIV 1 AMP | 83-1530-0151 | 1.0 |
| CR2,CR3 | 1N4002 | | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 2.0 |
| K1,K2 | KHP17D11 | | POTTR & BRUM | RELAY-4PDT,650 OHM 24VDC 3 AMP | 83-1550-3550 | 2.0 |
| P2 | 1-480278-0 | | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| R1 | 0A781-7149 | | MINCOM SPEC | RES-FXD,FILM,3.3K OHM,1/2W,2%S | 83-1520-7149 | 1.0 |
| R2 | 0A781-7220 | | MINCOM SPEC | RES-FXD,FILM,220 OHM,1/2W,2% S | 83-1520-7220 | 1.0 |
| R3 | 0A781-7337 | | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 1.0 |
| S1 | 1AF4 | | MICRO SWITCH | SWITCH-FOOT,SPDT, NOR-OPEN | 83-1550-5399 | 1.0 |
| 1 | 23000A951 | A | MINCOM | CHASSIS-SWITCH ASSY, FOOT | 83-3310-1135 | 1.0 |
| 2 | 23000A952 | A | MINCOM | BRACKET-RELAY | 83-3320-1677 | 1.0 |
| 3 | 23000A953 | | MINCOM | COVER-SWITCH ASSY | 83-3310-1136 | 1.0 |
| 4 | 9KH1 | | POT.BRUM | SOCKET-RELAY,14CONT | 83-1620-0108 | 2.0 |
| 5 | 2924 | | LERCO | TERM BD-GLASS,1.160WD X1.50 LG | 83-1640-0075 | 1.0 |
| 6 | 51F | | CINCH JONES | TERM BD- 2 CONT,.375WD X.750LG | 83-1640-0242 | 1.0 |
| 7 | #779 | | H.H. SMITH | CLAMP-STRAIN, .625 ID | 83-7650-0064 | 1.0 |
| 8 | N4 | | RICHCO | CLAMP-LOOP,.250 DIA,NYLON | 83-7650-0084 | 1.0 |
| 9 | | | | SCREW-MACH,PH,3-48UNC-2AX 5/16 | 83-9260-4510 | 2.0 |
| 10 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 12.0 |
| 11 | MS35206-214 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 5/16 | 83-9260-4514 | 7.0 |
| 12 | MS35206-229 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 1.0 |
| 13 | | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 7.0 |
| 14 | | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 1.0 |
| 15 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 7.0 |
| 16 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 1.0 |
| 17 | | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 1.0 |
| 18 | | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 1.0 |
| 19 | | | NATL WIRE | WIRE-TYPE B,20GA WHT NYLON JKT | 83-7910-0035 | AR |
| 20 | | | | LOCKWASHER-SPLIT, #3 | 83-9261-4302 | 2.0 |
| 21 | AN960-3 | | A&N STD | WASHER-FLAT,RD, #3 | 83-9261-4017 | 2.0 |

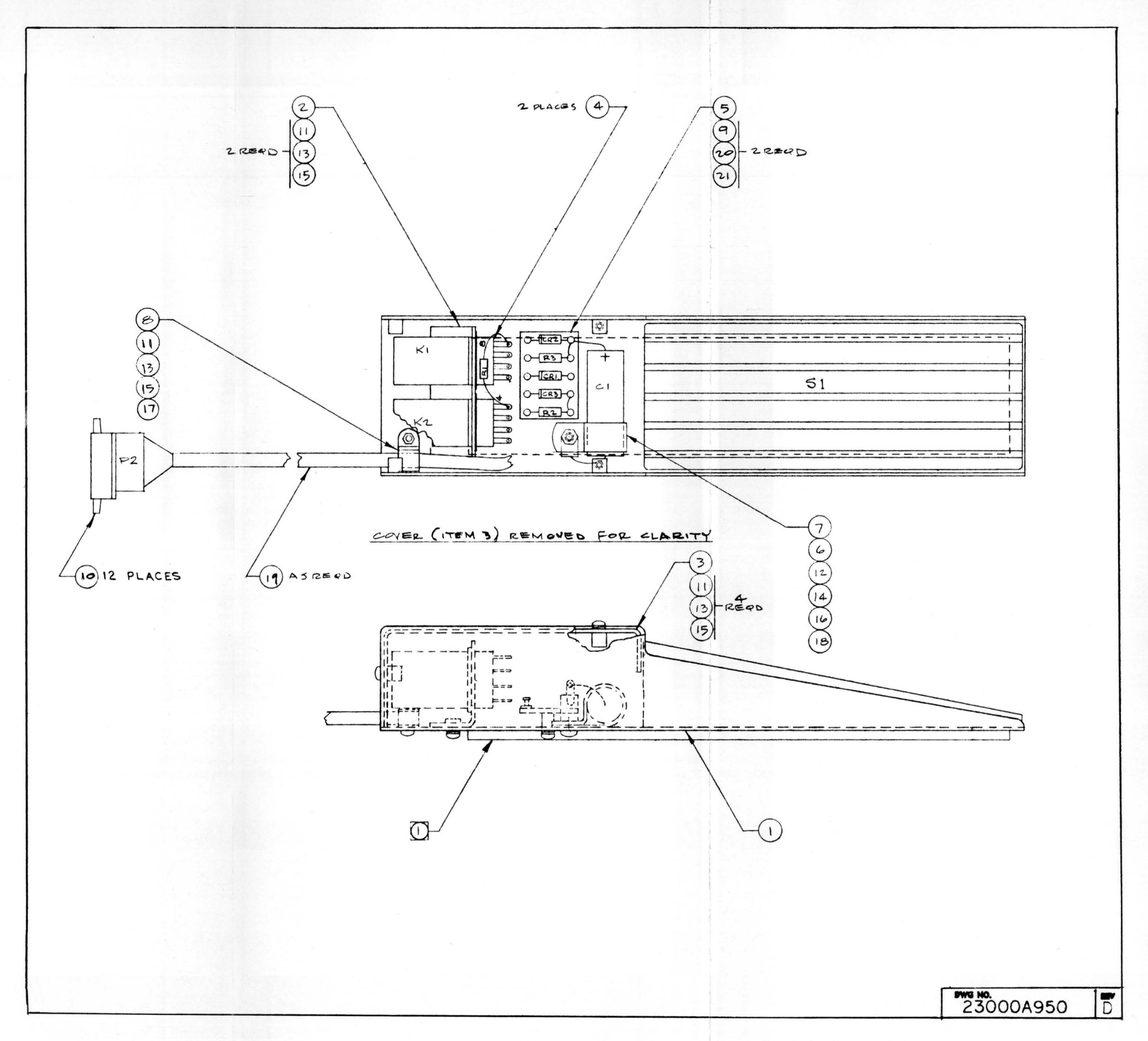



Figure 46. Tape Editing Switch Assembly

P A R T S   L I S T          PL 23000A951          REV A

TITLE CHASSIS-SWITCH ASSY, FOOT          CATALOG NO. 83-3310-1135

---------------- M A T E R I A L   R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | FE-832 | PENN ENGNRNG | NUT-CLINCH,SELF LOCK, 8-32UNC | 83-9264-0431 | 3.0 |
| 2 | 1591B | USECO | FASTENER-CHAS,TAP,4-40 X .105 | 83-9262-0265 | 4.0 |

PARTS LIST — PL 23000A952 — REV A

TITLE BRACKET-RELAY — CATALOG NO. 83-3320-1677

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | CLS-440-2 | PENN ENGNRNG | NUT-CAPTVE,4-40X.250 OD | 83-9264-0004 | 2.0 |

P A R T S   L I S T          PL 23000A960-1     REV B

TITLE  KIT-HD MTG PLATE/CONN,1/2 IN          CATALOG NO. 83-5990-0474

- - - - - - - - - - - - - - - -  M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | MRAC-25-G7 | | WINCHESTER | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| 2 | 100-2022S | | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 21.0 |
| 3 | 100-2022P | | WINCHESTER | PIN-CONTACT,CONN,.040DIA X.766 | 83-1610-0918 | 21.0 |
| 4 | 23000A011 | B | MINCOM | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 5 | 23001B010-1 | | MINCOM | MTG PLATE ASSY-REC/REP,1/2 IN | 83-5950-1236 | 1.0 |

PARTS LIST PL 23000A960-2 REV B

TITLE KIT-HD MTG PLATE/CONN, 1 IN CATALOG NO. 83-5990-0475

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | MRAC-25-G7 | | WINCHESTER | CONN-RECP,RECTANGLR,42 CON | 83-1610-0817 | 1.0 |
| 2 | 100-2022S | | WINCHESTER | SOCKET-CON,CONN,.766 LG,22 GA | 83-1610-0818 | 42.0 |
| 3 | 100-2022P | | WINCHESTER | PIN-CONTACT,CONN,.040DIA X.766 | 83-1610-0918 | 42.0 |
| 4 | 23000A011 | B | MINCOM | BRKT MTG-HEAD CONNECTOR | 83-3320-1468 | 2.0 |
| 5 | 23001B010-2 | | MINCOM | MTG PLATE ASSY-REC/REP,1 IN | 83-5950-1237 | 1.0 |

P A R T S   L I S T          PL 23000A970          REV C

TITLE  KIT-TILTING, TRANSPORT          CATALOG NO. 83-5990-0580

- - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23000A901 | D | MINCOM | KIT-INSTALLATION MTG TRANSPORT | 83-5990-0415 | 1.0 |
| 2 | 23028A010 | A | MINCOM | HINGE-PIVOT, CABINET, CONSOLE | 83-3270-0560 | 2.0 |
| 4 | 23028A005 | C | MINCOM | SUPPORT-TRANSPORT, CABINET | 83-3340-0500 | 1.0 |
| 5 | 23028A044 | A | MINCOM | SPACER-PLATE, TRANSPORT SUP | 83-3350-0474 | 2.0 |
| 6 | MS35649-82 | | MIL STD | NUT-HEX,PLAIN,8-32 X .344 WD | 83-9260-2006 | 4.0 |
| 7 | MS24693-S51 | | MIL STD | SCREW-MACH,FH,8-32 X .625 | 83-9260-6563 | 4.0 |
| 8 | | | | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4306 | 4.0 |
| 9 | SEE DESC | | A&N STD | WASHER-#8,ASA B27.2-1958 .164R | 83-9261-4005 | 4.0 |
| 10 | #9 | | DUCOMMUN | PLATE-MOUNTING, FLANG,3/4 THD | 83-1320-1705 | 1.0 |
| 12 | 23028A116 | A | MINCOM | SHAFT-SPRING, COUNTER BALANCE | 83-3280-0614 | 1.0 |
| 13 | 23028A114 | C | MINCOM | WASHER-SPRING, COUNTER BALANCE | 83-3261-4350 | 2.0 |
| 14 | 23028A115 | A | MINCOM | SPACER-SPRING,COUNTER BALANCE | 83-3350-0541 | 12.0 |
| 15 | H31U58 | | HUNTER SPR | SPRING-EXTENSION,.031 THKX 2WD | 83-1280-0616 | 1.0 |
| 19 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 2.0 |
| 20 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 22 | MS24665-2/6 | | | PIN-COTTER,.078 DIA X 1 1/2 LG | 83-7280-0617 | 2.0 |
| 23 | 23028A112 | | MINCOM | ARM-SUPPORT,COUNTER BALANCE | 83-3210-0287 | 1.0 |
| 24 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 2.0 |
| 25 | AN960-516L | | AN STD | WASHER-FLAT,LIGHT SERIES,#5/16 | 83-9261-4014 | 1.0 |
| 26 | MS35650-102 | | MIL STD | NUT-HEX,PLAIN,10-32 X .375 WD | 83-9260-2107 | 2.0 |
| 27 | MS24665-208 | | MIL STD | PIN-COTTER,.078 DIA X ;500 LG | 83-7280-0322 | 1.0 |

PARTS LIST PL 23004A000 REV F

TITLE MOTOR ASSY-TAKE UP REEL CATALOG NO. 83-4560-0090

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | LFSS-10 | | MIN PREC BRG | BRG-BALL,ANLR,PLAIN, .625 BORE | 83-1230-0331 | 1.0 |
| 2 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 4.0 |
| 3 | 23004A004 | B | MINCOM | ADAPTER-REEL HUB,REWIND MOTOR | 83-3240-0303 | 1.0 |
| 4 | 23004A003 | A | MINCOM | PLATE-MTG,TAKE UP & REWND MOT | 83-3320-1105 | 1.0 |
| 6 | 23004B001 | B | MINCOM | INDICATOR-FLAG,DIRECT SENSOR | 83-3550-5319 | 1.0 |
| 7 | 23004A005 | A | MINCOM | MOTOR-TAKE UP & REWIND,REEL | 83-3560-0091 | 1.0 |
| 8 | 23004B010 | A | MINCOM | P.C. BD ASSY, DIRECTION SENSOR | 83-4930-1496 | 1.0 |
| 9 | MS16997-22 | | MIL STANDARD | SCREW-CAP,SOC HD,6-32 X 3/4 | 83-9261-2033 | 1.0 |
| 10 | MS24693-S272 | | MIL STD | SCREW-MACH,FH,10-32 X 1/2 | 83-9260-6294 | 4.0 |
| 11 | MS51017-35 | | MIL STD | SETSCREW-CUP PT,8-32 X 1/4 | 83-9261-0069 | 3.0 |
| 12 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | AR |
| 13 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | AR |
| 14 | 23004A008 | A | MINCOM | MAGNET ASSY-BAR,IRON | 83-3190-0075 | 1.0 |
| 15 | | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 2.0 |
| 16 | #772 | | HH SMITH | CLAMP-STRAIN, .188 ID | 83-7650-0101 | 1.0 |
| 17 | MS16997-20 | | MIL STD | SCREW-CAP,SOC HD,6-32 X 1/2 LG | 83-9261-2031 | 1.0 |

PARTS LIST    PL 230048010    REV A

TITLE P.C. BD ASSY, DIRECTION SENSOR    CATALOG NO. 83-4930-1496

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| S13,S14 | MRR-2 | HAMLIN | SWITCH-REED,MAGNETIC,28V 470MA | 83-1550-5259 | 2.0 |
| 1 | 230048011 B | MINCOM | P.C. BD-DIRECTION SENSOR | 83-3640-1035 | 1.0 |
| 2 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 3.0 |
| 3 | 1-480277-0 | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| 4 | | AUTOLITE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0180 | AR |

PARTS LIST PL 23004A030 REV B

TITLE ACTUATOR ASSY-BRAKE,FAIL SAFE CATALOG NO. 83-4550-5402

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| L6 | 42C24DC-AX | PHILLIPS CON | SOLENOID-ELECTRICAL,PUSH/PULL | 83-1550-4516 | 1.0 |
| R73 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,150 OHM 2W 5% | 83-9520-5522 | 1.0 |
| S15 | MS24547-1 | MIL STD | SWITCH-BASIC,SPDT,28VDC 7 AMP | 83-1550-5067 | 1.0 |
| TB6 | 52 | CINCH-JONES | TERMINAL STRIP, LUG TYPE,2 LUG | 83-1640-1112 | 1.0 |
| 1 | JX-40 | MICRO SWITCH | ACTUATOR-SWITCH,SPG LEAF TYPE | 83-1550-5068 | 1.0 |
| 2 | 34013A926 | MINCOM | BRACKET-SUPPORT, FAIL SAFE | 83-3320-1640 | 1.0 |
| 3 | 34013A927 | MINCOM | BRACKET-SWITCH MTG,FAIL SAFE | 83-3320-1641 | 1.0 |
| 4 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 2.0 |
| 5 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 2.0 |
| 6 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 7 | MS35206-241 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/4 | 83-9260-4547 | 2.0 |
| 8 | | | WASHER-FLAT,SM PATT,#8 | 83-9261-4035 | 2.0 |
| 9 | | | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4306 | 2.0 |
| 10 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 1.0 |
| 11 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 2.0 |
| 12 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 13 | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 2.0 |
| 14 | MS35649-62 | MIL STD | NUT-HEX,PLAIN,6-32 X .313 WD | 83-9260-2005 | 2.0 |

P A R T S  L I S T  PL 23004A050  REV B

TITLE  MOTOR ASSY-REWIND,REEL  CATALOG NO. 83-4560-0092

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 4.0 |
| 2 | 1-480276-0 | | AMP INC | SHELL-CONN,RECT, .665 WD X.850 | 83-1610-0929 | 1.0 |
| 3 | 23004A004 | B | MINCOM | ADAPTER-REEL HUB,REWIND MOTOR | 83-3240-0303 | 1.0 |
| 4 | 23004A003 | A | MINCOM | PLATE-MTG,TAKE UP & REWND MOT | 83-3320-1105 | 1.0 |
| 5 | 23004A005 | A | MINCOM | MOTOR-TAKE UP & REWIND,REEL | 83-3560-0091 | 1.0 |
| 6 | MS24693-S272 | | MIL STD | SCREW-MACH,FH,10-32 X 1/2 | 83-9260-6294 | 4.0 |
| 7 | MS51017-35 | | MIL STD | SETSCREW-CUP PT,8-32 X 1/4 | 83-9261-0069 | 3.0 |
| 8 | 23013A063-1 | A | MINCOM | SPG-EXPAN,RET,CAPSTAN,1.810 LG | 83-3280-0524 | 1.0 |
| 9 | 7166 | | WALSCO | TERM-LUG, UNINS,FLAT,#6 | 83-9630-0028 | 4.0 |

PARTS LIST — PL 23004A900 — REV B

TITLE KIT-ASSY-MECHANICAL BRAKE — CATALOG NO. 83-5990-0556

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 2 | 34013A930-3 D | MINCOM | ARM ASSY-CLUTCH ROLLER, LH | 83-3210-0273 | 1.0 |
| 3 | 34013A930-4 D | MINCOM | ARM ASSY-CLUTCH ROLLER, RH | 83-3210-0274 | 1.0 |
| 5 | 2-37-E540-8 | PARKER SEAL | PKG-PREFORM,O-RING, 2.625 OD | 83-1290-0063 | 2.0 |
| 6 | 23013A063-1 A | MINCOM | SPG-EXPAN,RET,CAPSTAN,1.810 LG | 83-3280-0524 | 2.0 |
| 7 | 34013A928 | MINCOM | SPACER-ARM, CLUTCH ROLLER | 83-3350-0523 | 2.0 |
| 8 | 23004A030 B | MINCOM | ACTUATOR ASSY-BRAKE,FAIL SAFE | 83-4550-5402 | 1.0 |
| 9 | 23004A020 A | MINCOM | HUB ASSY-REEL,MOD 01123060 | 83-4930-1756 | 2.0 |
| 10 | 21-S-094-0437 | STD PRSD STL | PIN-SPRING, .094 DIAX.437LG | 83-7280-0223 | 1.0 |
| 11 | 4318 | PIC | SCREW-SHOULDER,8-32 X 5/16 LG | 83-9260-0030 | 2.0 |
| 12 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 2.0 |
| 13 | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 1.0 |
| 14 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 18 | 197 | BIRNBACH | LUG-GROUND #10 | 83-9630-0061 | 2.0 |

PARTS LIST — PL 23007C010-1 REV F

TITLE MOTOR ASSY-CAPSTAN,3 3/4-7 1/2 CATALOG NO. 83-4560-0149

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C64 | 200P1450 | | SPRAGUE | CAP-FXD,PLSTC, 2.UF 440V 10% | 83-1510-4433 | 1.0 |
| P8 | 1-480277-0 | | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 3-36-150E | | SPRAGUE | BRACKET-CAPACITOR MTG,.750 WD | 83-1320-1116 | 2.0 |
| 2 | MS35206-289 | | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 | D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35206-261 | | MIL STD | SCR-MACH,PAN HD,10-24 X 3/8 LG | 83-9260-4588 | 3.0 |
| 9 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 14 | 23007A011 | B | MINCOM | MOTOR-CAPSTAN DRIVE,TRANSPORT | 83-3560-0096 | 1.0 |
| 19 | MS35649-42 | | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

P A R T S   L I S T    PL 23007C010-2    REV F

TITLE MOTOR ASSY-CAPSTAN,7 1/2-15    CATALOG NO. 83-4560-0150

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C64 | 200P1450 | | SPRAGUE | CAP-FXD,PLSTC, 2.UF 440V 10% | 83-1510-4433 | 1.0 |
| P8 | 1-480277-0 | | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 3-36-150E | | SPRAGUE | BRACKET-CAPACITOR MTG,.750 WD | 83-1320-1116 | 2.0 |
| 2 | MS35206-289 | | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 | D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35206-261 | | MIL STD | SCR-MACH,PAN HD,10-24 X 3/8 LG | 83-9260-4588 | 3.0 |
| 9 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A015-1 | E | MINCOM | PULLEY-CAPSTAN DRIVE,.625 DIA | 83-3220-0147 | 1.0 |
| 14 | 23007A011 | B | MINCOM | MOTOR-CAPSTAN DRIVE,TRANSPORT | 83-3560-0096 | 1.0 |
| 15 | N5001-31 | | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | MS35206-245 | | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 1.0 |
| 17 | MS35338-42 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

P A R T S   L I S T          PL 23007C010-3     REV F

TITLE  MOTOR ASSY-CAPSTAN,15-30          CATALOG NO. 83-4560-0151

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C64 | 200P1450 | SPRAGUE | CAP-FXD,PLSTC, 2.UF 440V 10% | 83-1510-4433 | 1.0 |
| P8 | 1-480277-0 | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 3-36-150E | SPRAGUE | BRACKET-CAPACITOR MTG,.750 WD | 83-1320-1116 | 2.0 |
| 2 | MS35206-289 | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35206-261 | MIL STD | SCR-MACH,PAN HD,10-24 X 3/8 LG | 83-9260-4588 | 3.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A015-2 E | MINCOM | PULLEY-CAPSTAN DRIVE,1.250 DIA | 83-3220-0148 | 1.0 |
| 14 | 23007A011 B | MINCOM | MOTOR-CAPSTAN DRIVE,TRANSPORT | 83-3560-0096 | 1.0 |
| 15 | N5001-31 | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | MS35206-245 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 1.0 |
| 17 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

PARTS LIST PL 23007C010-4 REV F

TITLE MOTOR ASSY-CAPSTAN,50 CYCLE CATALOG NO. 83-4560-0158

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C64 | 200P1904 | | SPRAGUE | CAP-FXD,ELEC,5 MF 370VAC 10% | 83-1510-2243 | 1.0 |
| P8 | 1-480277-0 | | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 36-909H | | SPRAGUE | BRACKET-CAPACITOR MTG | 83-1320-1587 | 2.0 |
| 2 | MS35206-289 | | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 | D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35206-261 | | MIL STD | SCR-MACH,PAN HD,10-24 X 3/8 LG | 83-9260-4588 | 3.0 |
| 9 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A111 | B | MINCOM | PULLEY-CAPSTAN,50 CYC,7 1/2X15 | 83-3220-0243 | 1.0 |
| 14 | 2102-0W4 | | ELINCO | MOTOR-CAPSTAN DRIVE, | 83-1560-0156 | 1.0 |
| 15 | N5001-31 | | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | | | | SCREW-MACH,PAN HD,8-32 X 1.375 | 83-9260-4559 | 1.0 |
| 17 | MS35338-42 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |
| 22 | 23007A112 | B | MINCOM | FLYWHEEL-CAPSTAN,50 CYC,7 1/2 | 83-3220-0244 | 1.0 |
| 23 | DAN280-202 | | WOODRUFF | KEY-STD DESIGN,1/4DIA X 1/16 W | 83-1280-0094 | 1.0 |
| 24 | | | | NUT-PLAIN,HEX,1/2-32 X 5/8 | 83-9260-2417 | 1.0 |
| 25 | AN960-816L | | MIL STD | WASHER-FLAT,RD,.515ID X .875OD | 83-9261-4023 | 1.0 |

P A R T S   L I S T   PL 23007C010-5   REV F

TITLE MOTOR ASSY-CAPSTAN,15-30,50 CY   CATALOG NO. 83-4560-0159

- - - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C64 | 200P1904 | SPRAGUE | CAP-FXD,ELEC,5 MF 370VAC 10% | 83-1510-2243 | 1.0 |
| P8 | 1-480277-0 | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 36-909H | SPRAGUE | BRACKET-CAPACITOR MTG | 83-1320-1587 | 2.0 |
| 2 | MS35206-289 | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35206-261 | MIL STD | SCR-MACH,PAN HD,10-24 X 3/8 LG | 83-9260-4588 | 3.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A015-6 E | MINCOM | PULLEY-CAPSTAN DRIVE,1.503 DIA | 83-3220-0191 | 1.0 |
| 14 | 2102-0W4 | ELINCO | MOTOR-CAPSTAN DRIVE, | 83-1560-0156 | 1.0 |
| 15 | N5001-31 | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | MS35206-245 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 1.0 |
| 17 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

PARTS LIST PL 23007A030-1 REV C

TITLE DOOR ASSY-HEAD COVER,TPE TRANS CATALOG NO. 83-4330-0241

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 2 | 23007A032 | B MINCOM | SHAFT-ACTUATING,DOOR,HEAD COVR | 83-3280-0406 | 1.0 |
| 3 | 23007B034-1 | D MINCOM | DOOR-HEAD COVER, TAPE TRANS | 83-3330-0263 | 1.0 |
| 4 | 23007A033 | A MINCOM | SUPPORT-DOOR,HD CVR,TAPE TRANS | 83-3340-0381 | 1.0 |
| 5 | 23007A036-1 | B MINCOM | SHIELD-DOOR, HEAD COVER | 83-3650-0367 | 1.0 |
| 6 | GP24-125X312 | GROOV-PIN | PIN-GRVD,HDLS,.125DIA X.312 LG | 83-7280-0466 | 1.0 |
| 7 | #0 | GROOV-PIN | PIN-GRVD,HDED, .067 DIAX.125LG | 83-7280-0477 | 2.0 |

P A R T S   L I S T          PL 23007A030-2     REV C

TITLE  DOOR ASSY-HD COVER,TAPE TRANS          CATALOG NO. 83-4330-0271

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 2 | 23007A032 | B | MINCOM | SHAFT-ACTUATING,DOOR,HEAD COVR | 83-3280-0406 | 1.0 |
| 3 | 23007B034-2 | D | 3M | DOOR-HD COVER,TAPE TRANSPORT | 83-3330-0269 | 1.0 |
| 4 | 23007A033 | A | MINCOM | SUPPORT-DOOR,HD CVR,TAPE TRANS | 83-3340-0381 | 1.0 |
| 5 | 23007A036-2 | B | MINCOM | SHIELD-DOOR,HEAD COVER | 83-3650-0384 | 1.0 |
| 6 | GP24-125X312 | | GROOV-PIN | PIN-GRVD,HDLS,.125DIA X.312 LG | 83-7280-0466 | 1.0 |
| 7 | #0 | | GROOV-PIN | PIN-GRVD,HDED, .067 DIAX.125LG | 83-7280-0477 | 2.0 |

PARTS LIST    PL 23007A050-1    REV K

TITLE ARM ASSY-IDLER, ACTUATING,RH    CATALOG NO. 83-4210-0232

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23007A051 | C | MINCOM | ARM-ADJUSTING,IDLER,UPPER | 83-3210-0204 | 1.0 |
| 2 | 23007A052 | B | MINCOM | ARM-ADJUSTING,IDLER,LOWER | 83-3210-0205 | 1.0 |
| 3 | 23007A053 | A | MINCOM | SPRING-ADJUSTABLE ARM,IDLER | 83-3280-0411 | 1.0 |
| 5 | #511 | | MILFORD | RIVET-SIMI-TUBULAR,.123 X.254 | 83-9260-0046 | 2.0 |
| 6 | LP22D82P9 | | LONG LOK | SCR-SELF LKG,PAN HD,8-32X9/16 | 83-9262-0529 | 1.0 |
| 7 | MS27183-7 | | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 8 | S-832-2 | | PENN ENGR | NUT-PLAIN,CLIN,8-32 | 83-9264-2116 | 1.0 |
| 9 | 6593 | | BIRNBACH | INSULATOR-WASH, NYLON,.016 TK | 83-9630-0272 | 2.0 |

P A R T S  L I S T  PL 23007A050-2  REV K

TITLE ARM ASSY-IDLER,ACTUATING,LH  CATALOG NO. 83-4210-0256

- - - - - - - - - - - - - - - - - M A T E R I A L  R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23007A055 | C | MINCOM | ARM-ADJUSTING,IDLER,UPPER,INC | 83-3210-0257 | 1.0 |
| 2 | 23007A052 | B | MINCOM | ARM-ADJUSTING,IDLER,LOWER | 83-3210-0205 | 1.0 |
| 3 | 23007A053 | A | MINCOM | SPRING-ADJUSTABLE ARM,IDLER | 83-3280-0411 | 1.0 |
| 4 | 52-022-093-0312 | | ESNA | PIN-SPRING, .093 DIAX.312LG | 83-7280-0221 | 1.0 |
| 5 | #511 | | MILFORD | RIVET-SIMI-TUBULAR,.123 X.254 | 83-9260-0046 | 2.0 |
| 6 | LP22D82P9 | | LONG LOK | SCR-SELF LKG,PAN HD,8-32X9/16 | 83-9262-0529 | 1.0 |
| 7 | MS27183-7 | | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 8 | S-832-2 | | PENN ENGR | NUT-PLAIN,CLIN,8-32 | 83-9264-2116 | 1.0 |
| 9 | 6593 | | BIRNBACH | INSULATOR-WASH, NYLON,.016 TK | 83-9630-0272 | 2.0 |

PARTS LIST     PL 23007A060-1     REV F

TITLE CAPSTAN ASSY-TAPE TRANS,1/2 IN     CATALOG NO. 83-5920-0819

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 103S3CG-2 | BARDEN | BRG-BALL,PLAIN,ANLR,.6693 BORE | 83-1230-0313 | 1.0 |
| 2 | 103HDB5CG-2 | BARDEN | BRG-BALL,PLAIN, .6693 BORE | 83-1230-0335 | 1.0 |
| 4 | 23007A063-1 | E MINCOM | TAPE DR-CAPSTAN,1/2 IN TAPE | 83-3240-0292 | 1.0 |
| 5 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 7 | 23007A064-1 | E MINCOM | SHAFT-CAPSTAN,TAPE DRVE,1/2 IN | 83-3280-0409 | 1.0 |
| 8 | 23007A062 | D MINCOM | HOUSING-CAPSTAN,TAPE DRIVE | 83-3310-0836 | 1.0 |
| 9 | MS16625-137 | MIL STD | RING-RETNG, INT, 1.486 OD | 83-7270-0382 | 1.0 |
| 11 | 00000A816 | MINCOM | RING-RETNG,INT,1.526 FREE OP | 83-3270-0768 | 1.0 |
| 12 | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 13 | 23007A009-1 | B MINCOM | SHIM-CAPSTAN,.002 THK | 83-3230-0340 | AR |
| 14 | 23007A009-2 | B MINCOM | SHIM-CAPSTAN, .005 THK | 83-3230-0368 | AR |
| 15 | 23007A009-3 | B MINCOM | SHIM-CAPSTAN, .010 THK | 83-3230-0369 | AR |

PARTS LIST PL 23007A060-2 REV F

TITLE CAPSTAN ASSY-TAPE TRANSPORT CATALOG NO. 83-5920-0833

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 103S3CG-2 | | BARDEN | BRG-BALL,PLAIN,ANLR,.6693 BORE | 83-1230-0313 | 1.0 |
| 2 | 103HDB5CG-2 | | BARDEN | BRG-BALL,PLAIN, .6693 BORE | 83-1230-0335 | 1.0 |
| 4 | 23007A063-2 | E | MINCOM | CAPSTAN-TAPE GUIDE, 1 IN TAPE | 83-3240-0297 | 1.0 |
| 5 | 19007A022 | D | MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 7 | 23007A064-2 | E | MINCOM | SHAFT-CAPSTAN,1 IN TAPE | 83-3280-0410 | 1.0 |
| 8 | 23007A062 | D | MINCOM | HOUSING-CAPSTAN,TAPE DRIVE | 83-3310-0836 | 1.0 |
| 9 | MS16625-137 | | MIL STD | RING-RETNG, INT, 1.486 OD | 83-7270-0382 | 1.0 |
| 11 | 00000A816 | | MINCOM | RING-RETNG,INT,1.526 FREE OP | 83-3270-0768 | 1.0 |
| 12 | | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 13 | 23007A009-1 | B | MINCOM | SHIM-CAPSTAN,.002 THK | 83-3230-0340 | AR |
| 14 | 23007A009-2 | B | MINCOM | SHIM-CAPSTAN, .005 THK | 83-3230-0368 | AR |
| 15 | 23007A009-3 | B | MINCOM | SHIM-CAPSTAN, .010 THK | 83-3230-0369 | AR |

PARTS LIST — PL 23007A070 — REV C

TITLE BRKT ASSY-MOTOR MTG,CAPS DRIVE — CATALOG NO. 83-4320-1476

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23007A071 | A MINCOM | SLEEVE-RUBBER,.625 ID X 1.00LG | 83-3230-0393 | 2.0 |
| 2 | 23007A013 | A MINCOM | BUSHING-SPLIT,MOTOR SUPPORT | 83-3230-0303 | 2.0 |
| 3 | 23013A043 | C MINCOM | SHAFT-SUPPORT,CAPSTAN MOTOR | 83-3280-0421 | 1.0 |
| 4 | 23007A012 | D MINCOM | BRACKET-MTG,CAPSTAN MOTOR | 83-3320-1102 | 1.0 |
| 5 | MS35207-263 | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 4.0 |
| 6 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 7 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |

P A R T S   L I S T   PL 23007C410-1   REV B

TITLE MOTOR ASSY-CAPSTAN, 30-60   CATALOG NO. 83-4560-0152

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C64 | 200P1450 | SPRAGUE | CAP-FXD,PLSTC, 2.UF 440V 10% | 83-1510-4433 | 1.0 |
| P8 | 1-480277-0 | AMP INC | SHELL-CONN,RECT, .850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 3-36-150E | SPRAGUE | BRACKET-CAPACITOR MTG,.750 WD | 83-1320-1116 | 2.0 |
| 2 | MS35206-289 | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35207-261 | MIL STD | SCREW-MACH,PAN HD,10-32 X 3/8 | 83-9260-4570 | 3.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A415 B | MINCOM | PULLEY-CAPSTAN DRIVE, 120 IPS | 83-3220-0170 | 1.0 |
| 14 | 23007A011 B | MINCOM | MOTOR-CAPSTAN DRIVE,TRANSPORT | 83-3560-0096 | 1.0 |
| 15 | N5001-31 | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | MS35206-245 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 1.0 |
| 17 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

TITLE MOTOR ASSY-CAPSTAN, 60-120          CATALOG NO. 83-4560-0153

- - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C64 | 200P1904 | SPRAGUE | CAP-FXD,ELEC,5 MF 370VAC 10% | 83-1510-2243 | 1.0 |
| P8 | 1-480277-0 | AMP INC | SHELL-CONN,RECT,'.850 WD X.905 | 83-1610-0930 | 1.0 |
| R63 | 0367 | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| 1 | 36-909H | SPRAGUE | BRACKET-CAPACITOR MTG | 83-1320-1587 | 2.0 |
| 2 | MS35206-289 | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 3 | NAS620-416 | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 4 | MS35338-44 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 5 | 2154 | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |
| 6 | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 7 | 23007A017 D | MINCOM | BRACKET-CAPACITOR MTG | 83-3320-1582 | 1.0 |
| 8 | MS35207-261 | MIL STD | SCREW-MACH,PAN HD,10-32 X 3/8 | 83-9260-4570 | 3.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 3.0 |
| 10 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 3.0 |
| 11 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 8.0 |
| 12 | 6128 | LERCO | TERMINAL-INSUL,.250 OD,4-40 | 83-9630-0137 | 1.0 |
| 13 | 23007A415 B | MINCOM | PULLEY-CAPSTAN DRIVE, 120 IPS | 83-3220-0170 | 1.0 |
| 14 | 23007A411 | MINCOM | MOTOR-CAPSTAN DRIVE,TRANSPORT | 83-3560-0109 | 1.0 |
| 15 | N5001-31 | TRUARC | RING-RETNG,INT,.831 I D | 83-7270-0598 | 1.0 |
| 16 | MS35206-245 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 1.0 |
| 17 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 1.0 |
| 18 | MS27183-7 | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 1.0 |
| 19 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 20 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 21 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |

P A R T S   L I S T                    PL 23009A000        REV G

TITLE  PWR SUP ASSY-TRANSPORT ELECT            CATALOG NO. 83-5920-0820

---------------- M A T E R I A L   R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C65 | CG451T200C1 | MALLORY | CAP-FXD,ELECT, 450UF 200V | 83-1510-2205 | 1.0 |
| C66 | CG23U50C1 | MALLORY | CAP-FXD,ELECT, 2000UF 50V | 83-1510-2206 | 1.0 |
| F1 | 313005. | LITTELFUSE | FUSE-SLO-BLO,125V 5 AMP | 83-7550-8006 | 1.0 |
| J1 | 160-3 | AMPHENOL | CONN-PLUG,ELEC,POWER, 2 PIN | 83-1610-1107 | 1.0 |
| J3 | 200512-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0663 | 1.0 |
| Q60 | 2N174 | MOTOROLA | TSTR-GE,PNP, PWR, 80 VCB | 83-1530-2001 | 1.0 |
| T60 | 23009A004 A | MINCOM | XMFR-PWR,48-62 CPS.115V 10% | 83-3540-1141 | 1.0 |
| 3 | 342004 | LITTELFUSE | FUSEHOLDER-POST, AG 3 FUSE | 83-1620-0083 | 1.0 |
| 4 | 201924-1 | AMP INC | CLIP-SPG TENS,POSITION LOCKING | 83-1620-0127 | 1.0 |
| 6 | VR3 | MALLORY | CLAMP-COMP MTG,1.375 DIA | 83-1650-0371 | 2.0 |
| 7 | 23009A007 A | MINCOM | SPRING-LOCKOUT,POWER SUPPLY | 83-3280-0464 | 1.0 |
| 8 | 23009A001 B | MINCOM | CHASSIS-TRANSPORT ELECT,MDL 23 | 83-3310-0830 | 1.0 |
| 9 | 23009A006 A | MINCOM | BRACKET-LOCKOUT,CAPSTAN MOTOR | 83-3320-1168 | 1.0 |
| 10 | 200390-4 | AMP INC | RECP-GUIDE PIN,CENTER,SERIES M | 83-7270-0302 | 1.0 |
| 11 | 200389-4 | AMP INC | PIN-GUIDE,CENTER,AMP SERIES M | 83-7280-0196 | 1.0 |
| 12 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 11.0 |
| 13 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 12.0 |
| 14 | MS35206-230 | MIL STD | SCREW-MACH,PAN HD,6-32 X 1/2 | 83-9260-4533 | 3.0 |
| 17 | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 1.0 |
| 18 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 13.0 |
| 20 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 14.0 |
| 22 | #NCGB 122-37 | PIPCO INT | STRIP-GROMMET,.145 HT X.171 WD | 83-9630-0008 | 1.0 |
| 23 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 2.0 |
| 24 | 4451-C-9 | USECO | TERMINAL-FEEDTHRU, .094 LG | 83-9630-0559 | 1.0 |
| 25 | 23009A008 A | MINCOM | STOP-CAPSTAN MOTOR,TRANSPORT | 83-3350-0554 | 1.0 |
| 26 | 212-42-0183B | PLASTIGLIDE | BUSHING-ELEC COND,INSUL,NYLON | 83-9630-0300 | 1.0 |
| 27 | 7274633 | DELCO | KIT-TSTR MTG | 83-1530-2016 | 1.0 |

PARTS LIST PL 23010A910 REV A

TITLE KIT-EDIT, SWITCH ASSY CATALOG NO. 83-5990-0839

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| DS14 | 327 | | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 1.0 |
| S14 | 1018 | | PENDAR | SWITCH-PUSHBUTTON,SPDT,LIGHTED | 83-1550-5148 | 1.0 |
| 1 | SP191A080 | C | MINCOM OOT | RELAY ASSY-EDIT SWITCH | 83-4930-1908 | 1.0 |
| 2 | SP191A082-2 | A | MINCOM | PLATE-MASK,SW,EDIT,LONG | 83-3320-2143 | 1.0 |
| 3 | SP191A083 | A | MINCOM | PLATE-SWITCH,MTG,EDIT | 83-3320-2144 | 1.0 |
| 4 | 60510-4 | | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 3.0 |
| 5 | 23013A038-2 | E | MINCOM | LENS-IND LIGHT,PUSHBUTTON,EDIT | 83-3550-1758 | 1.0 |
| 6 | RAA-217 | | THOM & BETTS | SPLICE-CONDUCTOR,BUTT TYPE | 83-9630-0382 | 1.0 |
| 7 | | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0043 | AR |

P A R T S   L I S T   PL 23012A000   REV A

TITLE  BRACKET ASSY-VERNIER SPEED ADJ   CATALOG NO. 83-4930-1002

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | | | ALLMETAL | PIN-STR,HDLS, .188 DIAX1.125LG | 83-1280-0077 | 2.0 |
| 2 | 23012A001 | | MINCOM | ARM-SPEED ADJ,CAPSTAN DRIVE | 83-3210-0199 | 1.0 |
| 3 | 23012A004 | C | MINCOM | LEVER-SOLENOID SHAFT,CAPSTAN | 83-3210-0200 | 1.0 |
| 4 | 23012A002 | | MINCOM | PIVOT-SPEED ADJ,CAPSTAN DRIVE | 83-3280-0386 | 1.0 |
| 5 | 23012A003 | | MINCOM | SPRING-SPEED ADJ,CAPSTAN DRIVE | 83-3280-0387 | 1.0 |
| 6 | 5555-18 | | TRUARC | RING-RETNG, EXT, .181 ID | 83-7270-0488 | 4.0 |

TITLE TAPE DECK ASSY-ALL VERSIONS CATALOG NO. 83-5920-1344

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| R60 | TYPE RH-50 | DALE PRODUCT | RES-FXD,WW, 15 OHM, 50W, 5% | 83-1520-7593 | AR |
| R71 | 00000A737 | A MINCOM | RES-FXD,0-300K OHM 1/4W 5% | 83-3520-3276 | 1.0 |
| R75 | 1723 | OHMITE | RES-FXD, WW, 200 OHM 10W 5% | 83-1520-8006 | AR |
| 300 | 23013B990 | G MINCOM | KIT-COMMON PARTS,TAPE DECK | 83-5990-0564 | 1.0 |
| 304 | 23013B940 | B MINCOM | KIT-SPEED, 3 3/4-7 1/2 IPS | 83-5990-0559 | AR |
| 306 | 23013B945-1 | C MINCOM | KIT-SPEED, 7 1/2-15 IPS | 83-5990-0560 | AR |
| 307 | 23013B945-2 | C MINCOM | KIT-SPEED,7 1/2-15 IPS,50 CYC | 83-5990-0582 | AR |
| 308 | 23013B950-1 | C MINCOM | KIT-SPEED, 15-30 IPS | 83-5990-0561 | AR |
| 309 | 23013B950-2 | C MINCOM | KIT-SPEED,15-30 IPS,50 CYCLE | 83-5990-0581 | AR |
| 310 | 23013B955 | C MINCOM | KIT-SPEED, 30-60 IPS | 83-5990-0562 | AR |
| 312 | 23013B960 | C MINCOM | KIT-SPEED, 60-120 IPS | 83-5990-0563 | AR |
| 315 | 23013A970 | D MINCOM | KIT-BRAKE, CAPSTAN,HIGH SPEED | 83-5990-0438 | AR |
| 321 | 23013A900 | C MINCOM | KIT-CAPSTAN AREA PARTS,1/2 IN | 83-5990-0426 | AR |
| 322 | 23013A905 | C MINCOM | KIT-CAPSTAN AREA PARTS,1 INCH | 83-5990-0427 | AR |
| 327 | 23013A910 | C MINCOM | KIT-TAPE GUIDE,1/4 IN,1/2 CAP | 83-5990-0428 | AR |
| 328 | 23013A915 | C MINCOM | KIT-TAPE GUIDE,1/2 IN,1/2 CAP | 83-5990-0429 | AR |
| 329 | 23013A930 | C MINCOM | KIT-TAPE GUIDE,1/4 IN,1 IN CAP | 83-5990-0431 | AR |
| 330 | 23013A935 | C MINCOM | KIT-TAPE GUIDE,1/2 IN,1 IN CAP | 83-5990-0432 | AR |
| 331 | 23013B920 | D MINCOM | KIT-TAPE GUIDE, 1 INCH | 83-5990-0558 | AR |
| 332 | 23004A900 | B MINCOM | KIT-ASSY-MECHANICAL BRAKE | 83-5990-0556 | AR |
| 333 | 23013A980-1 | A MINCOM | KIT-HUB WDTH,W/O BK,1/4NAB&CIN | 83-5990-0642 | AR |
| 334 | 23013A980-2 | A MINCOM | KIT-HUB WDTH,W/O BK,1/2 NAB | 83-5990-0643 | AR |
| 335 | 23013A980-3 | A MINCOM | KIT-HUB WDTH,W/O BK,1 NAB | 83-5990-0644 | AR |
| 336 | 23013A985-1 | A MINCOM | KIT-HUB WDTH,WITH BK,1/4 CIN | 83-5990-0645 | AR |
| 337 | 23013A985-2 | A MINCOM | KIT-HUB WDTH,WITH BK,1/4 NAB | 83-5990-0646 | AR |
| 338 | 23013A985-3 | B MINCOM | KIT-HUB WDTH,WITH BK,1/2 NAB | 83-5990-0647 | AR |
| 339 | 23013A985-4 | B MINCOM | KIT-HUB WDTH,WITH BK,1 NAB | 83-5990-0648 | AR |

P A R T S   L I S T          PL 23013A030          REV B

TITLE   PANEL ASSY-DISTRIBUTION,TRANS          CATALOG NO. 83-4930-1003

- - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C64 | 200P1450 | | SPRAGUE | CAP-FXD,PLSTC, 2.UF 440V 10% | 83-1510-4433 | 1.0 |
| C68 | BR-100-150 | | CORNELL DUBL | CAP-FXD,ELECT, 100UF 150V | 83-1510-2207 | 1.0 |
| R63 | 0367 | | OHMITE | RES-ADJ, WW, 75 OHM 25W 10% | 83-1520-8306 | 1.0 |
| R68 | 4592 | | OHMITE | RES-FXD, WW,100 OHM 5W 5% | 83-1520-8185 | 1.0 |
| 1 | 3-36-150E | | SPRAGUE | BRACKET-CAPACITOR MTG,.750 WD | 83-1320-1116 | 2.0 |
| 2 | 3006 | | H.H. SMITH | TERM BD-2.250 BETWEEN MTG HOLE | 83-1640-0588 | 1.0 |
| 3 | 23013A031 | C | MINCOM | PLATE-CONN MTG,DIST PANEL | 83-3320-1104 | 1.0 |
| 4 | | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 2.0 |
| 5 | | | | NUT-HEX,SM PATT,1/4-20 X.438WD | 83-9260-2205 | 1.0 |
| 6 | 21FK-832 | | STD PRSD STL | NUT-HEX,SELF LOCK,8-32 X.345WD | 83-9260-2405 | 2.0 |
| 7 | | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 8 | MS35206-289 | | MIL STANDARD | SCREW-MACH,PAN HD,1/4-20 X 2.5 | 83-9260-4583 | 1.0 |
| 9 | MS35190-235 | | MIL STD | SCREW-MACH,FH,6-32 X 5/16 | 83-9260-6516 | 2.0 |
| 10 | | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 2.0 |
| 11 | MS27183-7 | | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 2.0 |
| 12 | NAS620-416 | | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 1.0 |
| 13 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 14 | MS35338-44 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 83-9261-4309 | 1.0 |
| 15 | 2154 | | H.H. SMITH | INSULATOR-WASH, FIBER,.250 ID | 83-9630-0046 | 2.0 |

PARTS LIST PL 23013B030 REV A

TITLE PANEL ASSY-DISTRIBUTION,TRANS CATALOG NO. 83-4930-1685

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C68 | BR-100-150 | CORNELL DUBL | CAP-FXD,ELECT, 100UF 150V | 83-1510-2207 | 1.0 |
| R68 | 4592 | OHMITE | RES-FXD, WW,100 OHM 5W 5% | 83-1520-8185 | 1.0 |
| TB2 | 3006 | H.H. SMITH | TERM BD-2.250 BETWEEN MTG HOLE | 83-1640-0588 | 1.0 |
| 1 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 2.0 |
| 2 | 23013A031 C | MINCOM | PLATE-CONN MTG,DIST PANEL | 83-3320-1104 | 1.0 |
| 3 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 2.0 |
| 4 | MS35190-235 | MIL STD | SCREW-MACH,FH,6-32 X 5/16 | 83-9260-6516 | 2.0 |
| 5 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 2.0 |

P A R T S   L I S T    PL 23013A040-1    REV C

TITLE  ARM ASSY-TAPE LIFTER,TRANSPORT    CATALOG NO. 83-4210-0206

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

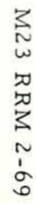
| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23013A042 | | MINCOM | ARM-LIFTER,TAPE TRANSPORT | 83-3210-0201 | 1.0 |
| 2 | 23013A041-1 | D | MINCOM | SHAFT-ARM,TAPE LIFTER,2.125 LG | 83-3280-0399 | 1.0 |
| 3 | 23013A041-2 | D | MINCOM | SHAFT-ARM,TAPE LIFTER,1.750 LG | 83-3280-0400 | 1.0 |
| 4 | MS35206-218 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 5/8 | 83-9260-4519 | 2.0 |
| 5 | | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 2.0 |
| 6 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 7 | M70AS1032-8C | | NYLOCK | SETSCREW-HEX,CUP PT,10-32X.50L | 83-9261-4392 | 1.0 |

PARTS LIST PL 23013A040-2 REV C

TITLE ARM ASSY-TAPE LIFTER,1 IN TAPE CATALOG NO. 83-4210-0242

---------------- MATERIAL REQUIREMENTS ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A042 | MINCOM | ARM-LIFTER,TAPE TRANSPORT | 83-3210-0201 | 1.0 |
| 2 | 23013A041-3 | D MINCOM | SHAFT-ARM,TAPE LIFTER,2.937 LG | 83-3280-0401 | 1.0 |
| 3 | 23013A041-4 | D 3M | SHAFT-ARM,TAPE LIFTER,2.562 LG | 83-3280-0404 | 1.0 |
| 4 | MS35206-218 | MIL STD | SCREW-MACH,PAN HD,4-40 X 5/8 | 83-9260-4519 | 2.0 |
| 5 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 2.0 |
| 6 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 7 | M70AS1032-8C | NYLOCK | SETSCREW-HEX,CUP PT,10-32X.50L | 83-9261-4392 | 1.0 |



PARTS LIST    PL 23013B050    REV E

TITLE HARNESS ASSY-TAPE TRANSPORT    CATALOG NO. 83-4570-0459

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C68 | BR-100-150 | CORNELL DUBL | CAP-FXD,ELECT, 100UF 150V | 83-1510-2207 | 1.0 |
| CR77 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | AR |
| J11 | 1-480304-0 | AMP INC | SHELL-CONN,RECT, 3 POSITION | 83-1610-1137 | 1.0 |
| P11 | 1-480305-0 | AMP INC | SHELL-CONN,RECT,3 POS | 83-1610-1142 | 1.0 |
| R68 | 4592 | OHMITE | RES-FXD, WW,100 OHM 5W 5% | 83-1520-8185 | 1.0 |
| R76 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,470 OHM 2W 5% | 83-9520-5528 | AR |
| S1,S2,S3,S4,S5 | 1018 | PENDAR | SWITCH-PUSHBUTTON,SPDT,LIGHTED | 83-1550-5148 | 5.0 |
| S6 | | LIKON | SWITCH-ALTERNATE ACT,ILLUM | 83-1550-5231 | 1.0 |
| S7,S9 | TYPE SS16 | STACKPOLE | SWITCH-SLIDE,DPTT | 83-1550-5232 | 2.0 |
| S8 | TYPE SS12 | STACKPOLE | SWITCH-SLIDE,4PDT | 83-1550-5230 | 1.0 |
| S10,S11 | 513-0101-604 | DIALCO | SWITCH-MOMENTARY,MAKE | 83-1550-5233 | 2.0 |
| 1 | 42981-1-LP 4 | AMP INC | SOCKET-CONTACT,CONN, SIZE 16 | 83-1610-0689 | 8.0 |
| 2 | 2VK18D/1-2 | VIKING | CONN-P.C.,ELEC,PIERCD, 36 CON | 83-1610-0782 | 2.0 |
| 3 | 1-480273-0 | AMP INC | SHELL-CONN,RECT,.565 WDX.65 | 83-1610-0923 | 1.0 |
| 4 | 1-480274-0 | AMP INC | SHELL-CONN,RECT,.65 WD X.805 | 83-1610-0924 | 2.0 |
| 5 | 60510-4 | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 44.0 |
| 6 | 1-480275-0 | AMP INC | SHELL-CONN,RECT, .650 WDX1.045 | 83-1610-0932 | 2.0 |
| 7 | 3006 | H.H. SMITH | TERM BD-2.250 BETWEEN MTG HOLE | 83-1640-0588 | 2.0 |
| 8 | 23013A017 B | MINCOM | CHASSIS-SWITCH MTG,TRANSPORT | 83-3310-0708 | 1.0 |
| 9 | 23013A016 C | MINCOM | PLATE-SWITCH MTG,TRANSPORT | 83-3320-1115 | 1.0 |
| 10 | SE-44 BRASS | UNITED SHOE | EYELET-BRASS,FLANGED,.112X.121 | 83-7290-0091 | 6.0 |
| 11 | | NATL WIRE | WIRE-TYPE B,20GA WHT NYLON JKT | 83-7910-0035 | AR |
| 12 | | NATL WIRE | WIRE-TYPE B,20GA BLK NYLON JKT | 83-7910-0039 | AR |
| 13 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0043 | AR |
| 14 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0052 | AR |
| 15 | #EXE-22-122 | THERMAX | WIRE-TYPE C,22GA WHT TEFLN JKT | 83-7910-0476 | AR |
| 16 | #EXE-20-120 | THERMAX | WIRE-TYPE C,20GA WHT TEFLN JKT | 83-7910-0496 | AR |
| 17 | YEC110 | BURNDY | FERRULE-RF CABLE GND,.083 ID | 83-9690-0181 | 2.0 |
| 18 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 2.0 |
| 19 | 42983-1-LP | AMP INC | CONTACT-ELEC,SOC, 16 SIZE | 83-1610-0678 | 13.0 |
| 20 | RAA-217 | THOM & BETTS | SPLICE-CONDUCTOR,BUTT TYPE | 83-9630-0382 | 4.0 |
| 21 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 2.0 |
| 22 | RA873 | THOM & BETTS | LUG-TERMINAL SOLDERLS,RING,#10 | 83-9630-0205 | 4.0 |
| 23 | RB853 | THOMS & BETS | TERM-LUG, INSUL,R TG, .31WD | 83-9630-0206 | 2.0 |
| 26 | 23013A031 C | MINCOM | PLATE-CONN MTG,DIST PANEL | 83-3320-1104 | 1.0 |
| 28 | MS35190-235 | MIL STD | SCREW-MACH,FH,6-32 X 5/16 | 83-9260-6516 | 4.0 |
| 30 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 4.0 |

PARTS LIST    PL 23013B050    REV E

TITLE HARNESS ASSY-TAPE TRANSPORT    CATALOG NO. 83-4570-0459

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 31 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 2.0 |
| 32 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 4.0 |
| 33 | | | NUT-PLAIN,HEX,5/8-24,3/32 THK | 83-9260-0064 | 1.0 |

PARTS LIST PL 23013B060 REV G

TITLE P.C. BD ASSY-LOGIC TRANSPORT CATALOG NO. 83-4930-1716

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1 | TC3501 | MALLORY | CAP-FXD,ELECT, 100UF 50V | 83-1510-2045 | 1.0 |
| C3 | BR250-50 | CORNELL DUBL | CAP-FXD,ELECT, 250UF 50V | 83-1510-2031 | 1.0 |
| C4,C5,C6 | TYPE P123ZNP | AEROVOX | CAP-FXD,PAPER .47UF 400V 20% | 83-1510-4072 | 3.0 |
| C7 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C8,C9 | TYPE P123ZNP | AEROVOX | CAP-FXD,PAPER, .01UF 200V 25% | 83-1510-4046 | 2.0 |
| C10 | 00000A748 B | MINCOM | CAP-SEL VAL,.008-.015MFD,500V | 83-3510-5368 | 1.0 |
| C11 | 313-M | ARCO | CAP-VAR,MICA,1000-2155PF 500V | 83-1510-5001 | 1.0 |
| C12 | OD475X9035B2 | SPRAGUE | CAP-FXD,TA, 4.7UF 35V 10% | 83-1510-6095 | 1.0 |
| CR1,CR3,CR6,CR7,CR8,CR9, CR10,CR13,CR14,CR15,CR17, CR19,CR20,CR21,CR24,CR25, CR26,CR27,CR28,CR29,CR41 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 21.0 |
| CR4,CR16,CR18,CR30,CR31, CR32,CR37,CR38,CR39,CR40, CR42,CR43,CR44,CR45 | IN4004 | MOTOROLA | RECT -SI,DIF JCT,400PIV 1 AMP | 83-1530-0151 | 14.0 |
| CR46,CR47,CR48,CR49 | MR1033A | MOTOROLA | RECT-S1, 300 PRV, 3.0 AMP | 83-1530-0364 | 4.0 |
| CR50,CR51 | 1N4750 | MOTOROLA | DIODE-S1,ZENER, 27 V, 30 MA | 83-1530-0365 | 2.0 |
| CR52,CR53 | 1N3002 | MOTOROLA | DIODE-SI,ZENER, 75V 33 MA | 83-1530-0301 | 2.0 |
| F1 | 312004. | LITTELFUSE | FUSE-QUICK ACT,250V 4 AMP | 83-7550-8016 | 1.0 |
| K1,K2,K3,K4,K5,K6,K7,K8 | KHP17D12 | POT & BRUMFD | RELAY-4PDT, 24 VDC 650 OHM | 83-1550-3678 | 8.0 |
| Q1,Q2,Q3 | 2N3053 | R.C.A. | TSTR-SI,NPN, PWR, 60 VCB | 83-1530-2180 | 3.0 |
| R1 | 0A781-7331 | MINCOM SPEC | RES-FXD,FILM,27 OHM,1/2W,2% S | 83-1520-7331 | 1.0 |
| R5 | 0A781-7221 | MINCOM SPEC | RES-FXD,FILM,100 OHM,1/2W,2% S | 83-1520-7221 | 1.0 |
| R6 | 1720 | OHMITE | RES-FXD, WW,100 OHM 10W 5% | 83-1520-8253 | 1.0 |
| R7 | 0A781-7335 | MINCOM SPEC | RES-FXD,FILM,39 OHM,1/2W,2% S | 83-1520-7335 | 1.0 |
| R8 | 1730 | OHMITE | RES-FXD, WW,500 OHM 10W 5% | 83-1520-8007 | 1.0 |
| R9 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,100 OHM 2W 5% | 83-9520-5520 | 1.0 |
| R10,R11 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,270 OHM 1W 5% | 83-9520-4091 | 2.0 |
| R12,R13 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,2.7 OHM 1W 5% | 83-9520-4000 | 2.0 |
| R14 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,1.2K OHM 1W 5% | 83-9520-4153 | 1.0 |
| R15 | 0A781-7355 | MINCOM SPEC | RES-FXD,FILM,560 OHM,1/2W,2% S | 83-1520-7355 | 1.0 |
| R16 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,150 OHM 1W 5% | 83-9520-4134 | 1.0 |
| R17,R18 | 0A781-7337 | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 2.0 |
| R19,R20 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 2.0 |
| R21,R22 | 0A781-7375 | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 2.0 |
| R23 | 0A781-7325 | MINCOM SPEC | RES-FXD,FILM,10 OHM,1/2W,2% S | 83-1520-7325 | 1.0 |
| T1 | 00000A721 B | MINCOM | XMFR-TORROIDAL,BIFILAR | 83-3540-1153 | 1.0 |

PARTS LIST PL 23013B060 REV G

TITLE P.C. BD ASSY-LOGIC TRANSPORT CATALOG NO. 83-4930-1716

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 9KH-2 | POTTR & BRUM | SOCKET-RELAY,14 PIN | 83-1620-0184 | 8.0 |
| 2 | 23013A061 G | MINCOM | P.C. BD-BIAS OSCILLATR & LOGIC | 83-3640-0595 | 1.0 |
| 3 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 2.0 |
| 5 | | | SCREW-MACH,PAN HD,6-32 X 2 1/4 | 83-9260-4594 | 2.0 |
| 6 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 2.0 |
| 7 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 5.0 |
| 10 | 2515 | H.H.SMITH | INSULATOR-WASH, NYLON,#6 | 83-9630-0268 | 6.0 |
| 11 | #EXE-22-122 | THERMAX | WIRE-TYPE C,22GA WHT TEFLN JKT | 83-7910-0476 | AR |
| 12 | KHP | POTTER/BRUMF | SPG-HOLD DOWN,RELAY | 83-1280-0571 | 8.0 |
| 13 | MS35206-227 | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 3.0 |
| 14 | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 3.0 |
| 15 | 8070-E | LERCO | SPACER-SLV, HEX, TAP, .500 LG | 83-9350-0063 | 15.0 |
| 16 | 4405 | BUSSMANN MFG | FUSEHOLDER-BLOCK,AG 3 FUSE | 83-1620-0001 | 1.0 |
| 17 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 1.0 |
| 18 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 1.0 |
| 19 | MS35335-29 | MIL STD | WASHER-LOCK,FLAT,EXT T,#4 | 83-9261-4101 | 1.0 |
| 20 | | | WASHER-PLAIN,.125ID X.187OD | 83-9630-0115 | 1.0 |
| 21 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 4.0 |
| 21 | | | CANCEL- 1-26-68, PER EO 12228 | 83-9261-2201 | 1.0 |
| 22 | 3025-005 | 3M | TUBING-CLEAR VINYL,.047 ID | 83-7910-0272 | AR |
| 23 | 10160-DAP | MILTON ROSS | PAD-TRANSISTOR,FOR TO-5 CASES | 83-9690-0145 | 1.0 |

PARTS LIST    PL 23013A070    REV C

TITLE P.C. BD ASSY-SENSOR,INCOMING    CATALOG NO. 83-4930-1046

---------------- MATERIAL REQUIREMENTS ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C67 | TSD1-35-105 | COMP INC | CAP-FXD,TA, 1UF 35V 20% | 83-1510-6208 | 1.0 |
| CR63 | 3P60 | SOLID STATE | SEMICOND DEV-PHOTO,LT ACT SWTC | 83-1530-6013 | 1.0 |
| CR65 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 1.0 |
| R67 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,100K OHM 1/4W 5% | 83-9520-2119 | 1.0 |
| 1 | 23013A071 | MINCOM | P.C. BD-SENSOR,INCOMING,TAPE | 83-3640-0608 | 1.0 |

P A R T S   L I S T          PL 23013B075          REV C

TITLE  P.C. BD ASSY-TAPE SENSOR,OUTGO          CATALOG NO. 83-4930-1691

- - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| Q61,Q62 | 2N3391 | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2226 | 2.0 |
| R72 | LITTLE DEVIL | OHMITE | RES-FXD,COMP, 12K OHM 1/4W 5% | 83-9520-2159 | 1.0 |
| 1 | 23013B076 C | MINCOM | P.C. BD-TAPE SENSOR, OUTGOING | 83-3640-1093 | 1.0 |

PARTS LIST PL 23013B080 REV C

TITLE CHASSIS ASSY-WRAP AROUND,TRANS CATALOG NO. 83-5920-1332

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| R60 | P25CH | | SAGE | RES-FXD, WW, 15 OHM 25W 3% | 83-1520-7753 | 1.0 |
| R61 | 0568B | | OHMITE | RES-ADJ, WW,300 OHM 50W 10% | 83-1520-8311 | 1.0 |
| R62 | 0568C | | OHMITE | RES-ADJ, WW,400 OHM 50W 10% | 83-1520-8312 | 1.0 |
| S12 | MS24547-1 | | MIL STD | SWITCH-BASIC,SPDT,28VDC 7 AMP | 83-1550-5067 | 1.0 |
| 1 | JX-40 | | MICRO SWITCH | ACTUATOR-SWITCH,SPG LEAF TYPE | 83-1550-5068 | 1.0 |
| 2 | RE148 | | ROTRON | FAN-TUBEAXIAL,115 V, 100 CFM | 83-1560-0104 | 1.0 |
| 3 | 3-11 | | LEECRAFT | LAMPHOLDER-NE-51,NEON,.593 DIA | 83-1620-0180 | 1.0 |
| 4 | 23007A007 | B | MINCOM | BRACKET-SWITCH MTG,DOOR | 83-3320-1158 | 1.0 |
| 5 | 23013A034-2 | A | MINCOM | SUPPORT-TAPE DECK,TRANSPORT | 83-3340-0692 | 1.0 |
| 6 | 23013B050 | E | MINCOM | HARNESS ASSY-TAPE TRANSPORT | 83-4570-0459 | 1.0 |
| 9 | 23013B075 | C | MINCOM | P.C. BD ASSY-TAPE SENSOR,OUTGO | 83-4930-1691 | 1.0 |
| 10 | 23009A000 | G | MINCOM | PWR SUP ASSY-TRANSPORT ELECT | 83-5920-0820 | 1.0 |
| 11 | MS35649-42 | | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 2.0 |
| 12 | | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 10.0 |
| 13 | MS35206-215 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 2.0 |
| 14 | MS35206-228 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 5.0 |
| 15 | | | | SCREW-MACH,PAN HD,6-32 X 9/16 | 83-9260-4534 | 4.0 |
| 17 | | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 2.0 |
| 18 | | | | WASHER-FLAT,GENERAL PURPOSE,#6 | 83-9261-4004 | 4.0 |
| 19 | | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 6.0 |
| 20 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 21 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 10.0 |
| 22 | MS35206-229 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 1.0 |
| 23 | 23013A081 | A | MINCOM | SHIELD-MOTOR, FAN | 83-3650-0562 | 1.0 |

PARTS LIST PL 23013A090-1 REV A

TITLE ARM ASSY-IDLER,ROLLER,LH CATALOG NO. 83-4210-0230

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A006 B | MINCOM | ARM-ROLLER,IDLER | 83-3210-0203 | 1.0 |
| 2 | 23013A012 | MINCOM | PIN-ACTUATOR,IDLER ARM | 83-3280-0408 | 1.0 |
| 3 | GP67-125X500-12 | GROOV-PIN | PIN-GRVD,HDLS, .125 DIAX.500LG | 83-7280-0202 | 1.0 |
| 4 | CLS-440-3 | PENN ENGNRNG | NUT-CLINCH,PLAIN,4-40 X .250WD | 83-9264-0005 | 1.0 |



P A R T S   L I S T          PL 23013A090-2     REV A

TITLE  ARM ASSY-IDLER,ROLLER,RH          CATALOG NO. 83-4210-0231

- - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23013A006 | B | MINCOM | ARM-ROLLER,IDLER | 83-3210-0203 | 1.0 |
| 2 | 23013A012 | | MINCOM | PIN-ACTUATOR,IDLER ARM | 83-3280-0408 | 1.0 |
| 3 | GP67-125X500-12 | | GROOV-PIN | PIN-GRVD,HDLS, .125 DIAX.500LG | 83-7280-0202 | 1.0 |
| 4 | CLS-440-3 | | PENN ENGNRNG | NUT-CLINCH,PLAIN,4-40 X .250WD | 83-9264-0005 | 1.0 |

PARTS LIST PL 23013A095 REV B

TITLE ARM ASSY-ACTUATOR,DOOR HD CVR CATALOG NO. 83-4210-0237

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23007A031 | C MINCOM | LEVER-DOOR,HEAD COVER | 83-3210-0202 | 1.0 |
| 2 | 23007A035 | C MINCOM | BRACKET-LEVER MTG,DASHPOT | 83-3320-1049 | 1.0 |

PARTS LIST — PL 23013A125-1 — REV A

TITLE TAPE GUIDE ASSY-PREPLAY — CATALOG NO. 83-3240-0440

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A129-1 | MINCOM | SHAFT-TAPE GUIDE, PREPLAY | 83-3280-0612 | 1.0 |
| 2 | 23013A128-2 | MINCOM | CAP-TAPE GUIDE,PREPLAY,.500 HT | 83-3250-0153 | 1.0 |
| 3 | 23013A127-1 | MINCOM | HOUSING-TAPE GUIDE,PREPLAY | 83-3310-1132 | 1.0 |
| 4 | 23013A126 | MINCOM | SPRING-WASHER,BGR PRELOAD | 83-3280-0611 | 1.0 |
| 5 | S814FCZZ7LG31 | | BRG-BALL,ANLR,FLNGD,.2500 BORE | 83-1230-0325 | 2.0 |
| 6 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | 1.0 |

PARTS LIST — PL 23013A125-2 REV A

TITLE TAPE GUIDE ASSY-PREPLAY,1/2 IN — CATALOG NO. 83-3240-0442

---------------- MATERIAL REQUIREMENTS ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A129-1 | MINCOM | SHAFT-TAPE GUIDE, PREPLAY | 83-3280-0612 | 1.0 |
| 2 | 23013A128-1 | MINCOM | CAP-TAPE GUIDE, PREPLAY | 83-3250-0151 | 1.0 |
| 3 | 23013A127-1 | MINCOM | HOUSING-TAPE GUIDE,PREPLAY | 83-3310-1132 | 1.0 |
| 4 | 23013A126 | MINCOM | SPRING-WASHER,BGR PRELOAD | 83-3280-0611 | 1.0 |
| 5 | S814FCZZ7LG31 | | BRG-BALL,ANLR,FLNGD,.2500 BORE | 83-1230-0325 | 2.0 |
| 6 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | 1.0 |

P A R T S   L I S T    PL 23013A125-3    REV A

TITLE  TAPE GUIDE ASSY-PREPLAY,1 INCH    CATALOG NO. 83-3240-0443

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A129-2 | MINCOM | SHAFT-TAPE GUIDE, 1 INCH | 83-3280-0619 | 1.0 |
| 2 | 23013A128-1 | MINCOM | CAP-TAPE GUIDE, PREPLAY | 83-3250-0151 | 1.0 |
| 3 | 23013A127-2 | MINCOM | HOUSING-TAPE GUIDE,PREPLAY,1IN | 83-3310-1152 | 1.0 |
| 4 | 23013A126 | MINCOM | SPRING-WASHER,BGR PRELOAD | 83-3280-0611 | 1.0 |
| 5 | S814FCZZ7LG31 | | BRG-BALL,ANLR,FLNGD,.2500 BORE | 83-1230-0325 | 2.0 |
| 6 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | 1.0 |

P A R T S   L I S T          PL 23013A160          REV A

TITLE  HUB ASSY-REEL, 1/4 IN TAPE          CATALOG NO. 83-4930-1884

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A062 | C MINCOM | BASE-REEL HUB, 1/4 IN TAPE | 83-3240-0364 | 1.0 |
| 2 | 23013A162 | A MINCOM | TIRE-BRAKE, RUBBER | 83-3390-0037 | 1.0 |
| 3 | 23013A161 | MINCOM | RING-BRAKE, REEL HUB,1/4 IN | 83-3220-0217 | 1.0 |
| 4 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | 3.0 |

PARTS LIST PL 23013A900 REV C

TITLE KIT-CAPSTAN AREA PARTS,1/2 IN CATALOG NO. 83-5990-0426

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|---|
| 56 | 23013A064-1 | C | MINCOM | SCREW-MTG, TAPE GUIDE | | 83-3262-0537 | 4.0 |
| 31 | 23007A030-1 | C | MINCOM | DOOR ASSY-HEAD COVER,TPE TRANS | 10 | 83-4330-0241 | 1.0 |
| 32 | MS35206-228 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 10 | 83-9260-4531 | 2.0 |
| 33 | 23013A056-1 | A | MINCOM | BLADE-TAPE EDITING,TAPE GUIDE | 11 | 83-3330-0259 | 1.0 |
| 34 | MS35206-212 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/16 | 11 | 83-9260-4512 | 1.0 |
| 35 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 11 | 83-9261-4303 | 3.0 |
| 36 | 23007A060-1 | F | MINCOM | CAPSTAN ASSY-TAPE TRANS,1/2 IN | 13 | 83-5920-0819 | 1.0 |
| 37 | MS16998-31 | | MIL STD | SCREW-SHC, 10-32X1 | 13 | 83-9261-2105 | 3.0 |
| 38 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 13 | 83-9261-4307 | 3.0 |
| 39 | | | | WASHER-FLAT,SM PATT,#10 | 13 | 83-9261-4046 | 3.0 |
| 40 | 23013A040-1 | C | MINCOM | ARM ASSY-TAPE LIFTER,TRANSPORT | 16 | 83-4210-0206 | 1.0 |
| 41 | | | NYLOCK | SCREW-MACH,FH,100% 10-32 X 5/8 | 16 | 83-9260-0029 | 1.0 |
| 42 | 23007A040-1 | B | MINCOM | ROLLER ASSY-IDLER,1/2 IN INCOM | 16 | 83-4240-0310 | 1.0 |
| 43 | 23007A040-2 | B | MINCOM | ROLLER ASSY-IDLER,1/2 IN OTGNG | 16 | 83-4240-0311 | 1.0 |
| 44 | MS35206-223 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 1 1/2 | 16 | 83-9260-4525 | 2.0 |
| 46 | 23007A020-1 | D | MINCOM | IDLER ASSY-REVERSING,1/2 INCH | 16 | 83-4240-0318 | 1.0 |
| 47 | MS16997-66 | | MIL STD | SCREW-CAP,SOC HD,1/4-20 X 2.00 | 16 | 83-9261-2123 | 1.0 |
| 48 | MS35338-44 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 16 | 83-9261-4309 | 1.0 |
| 49 | AN960-416L | | A & N STD | WASHER-FLAT,LIGHT SERIES,#1/4 | 16 | 83-9262-0046 | 1.0 |
| 50 | 23007A044-1 | A | MINCOM | SHIM-IDLER,TAPE DRIVE,.002 THK | 16 | 83-3230-0362 | AR |
| 51 | 23007A044-2 | A | MINCOM | SHIM-IDLER,TAPE DRIVE,.005 THK | 16 | 83-3230-0363 | AR |
| 52 | 23007A044-3 | A | MINCOM | SHIM-IDLER,TAPE DRIVE,.010 THK | 16 | 83-3230-0364 | AR |
| 53 | 23007A044-4 | A | MINCOM | SHIM-IDLER,TAPE DRIVE,.020 THK | 16 | 83-3230-0365 | AR |
| 54 | 23007A003-1 | D | MINCOM | COVER-IDLER,SNAP-ON,LH,1/2 IN | 20 | 83-3310-0846 | 1.0 |
| 55 | 23007A003-2 | D | MINCOM | COVER-IDLER,SNAP-ON,RH,1/2 IN | 20 | 83-3310-0847 | 1.0 |

P A R T S   L I S T        PL 23013A905        REV C

TITLE  KIT-CAPSTAN AREA PARTS,1 INCH        CATALOG NO. 83-5990-0427

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 56 | 23013A064-2 | C MINCOM | SCREW-MTG, TAPE GUIDE | | 83-3262-0538 | 4.0 |
| 31 | 23007A030-2 | C MINCOM | DOOR ASSY-HD COVER,TAPE TRANS | 10 | 83-4330-0271 | 1.0 |
| 32 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 10 | 83-9260-4531 | 2.0 |
| 33 | 23013A056-2 | A MINCOM | BLADE-TAPE EDITING,1.12 LG | 11 | 83-3330-0268 | 1.0 |
| 34 | MS35206-212 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/16 | 11 | 83-9260-4512 | 1.0 |
| 35 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 11 | 83-9261-4303 | 3.0 |
| 36 | 23007A060-2 | F MINCOM | CAPSTAN ASSY-TAPE TRANSPORT | 13 | 83-5920-0833 | 1.0 |
| 37 | MS16998-31 | MIL STD | SCREW-SHC, 10-32X1 | 13 | 83-9261-2105 | 3.0 |
| 38 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 13 | 83-9261-4307 | 3.0 |
| 39 | | | WASHER-FLAT,SM PATT,#10 | 13 | 83-9261-4046 | 3.0 |
| 40 | 23013A040-2 | C MINCOM | ARM ASSY-TAPE LIFTER,1 IN TAPE | 16 | 83-4210-0242 | 1.0 |
| 41 | | NYLOCK | SCREW-MACH,FH,100% 10-32 X 5/8 | 16 | 83-9260-0029 | 1.0 |
| 42 | 23007A040-3 | B MINCOM | ROLLER ASSY-IDLER,1 IN INCOM | 16 | 83-4240-0314 | 1.0 |
| 43 | 23007A040-4 | B MINCOM | ROLLER ASSY-IDLER,1 IN OUTGO | 16 | 83-4240-0315 | 1.0 |
| 44 | | | SCREW-MACH,PAN HD, 4-40 X 2.00 | 16 | 83-9260-4604 | 2.0 |
| 46 | 23007A020-2 | D MINCOM | IDLER ASSY-REV,TAPE TRANSPORT | 16 | 83-4240-0319 | 1.0 |
| 47 | MS16997-66 | MIL STD | SCREW-CAP,SOC HD,1/4-20 X 2.00 | 16 | 83-9261-2123 | 1.0 |
| 48 | MS35338-44 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#1/4 | 16 | 83-9261-4309 | 1.0 |
| 49 | AN960-416L | A & N STD | WASHER-FLAT,LIGHT SERIES,#1/4 | 16 | 83-9262-0046 | 1.0 |
| 50 | 23007A044-1 | A MINCOM | SHIM-IDLER,TAPE DRIVE,.002 THK | 16 | 83-3230-0362 | AR |
| 51 | 23007A044-2 | A MINCOM | SHIM-IDLER,TAPE DRIVE,.005 THK | 16 | 83-3230-0363 | AR |
| 52 | 23007A044-3 | A MINCOM | SHIM-IDLER,TAPE DRIVE,.010 THK | 16 | 83-3230-0364 | AR |
| 53 | 23007A044-4 | A MINCOM | SHIM-IDLER,TAPE DRIVE,.020 THK | 16 | 83-3230-0365 | AR |
| 54 | 23007A003-3 | D MINCOM | COVER-IDLER,SNAP-ON,1 IN LH | 20 | 83-3310-0848 | 1.0 |
| 55 | 23007A003-4 | C MINCOM | COVER-IDLER,SNAP-ON,1 IN RH | 20 | 83-3310-0849 | 1.0 |

PARTS LIST PL 23013A910 REV C

TITLE KIT-TAPE GUIDE,1/4 IN,1/2 CAP CATALOG NO. 83-5990-0428

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|---|
| 67 | 23013A077-1 | | MINCOM | SHIM-TAPE GUIDE,.002 THK | | 83-3230-0401 | AR |
| 68 | 23013A077-2 | | MINCOM | SHIM-TAPE GUIDE,.005 THK | | 83-3230-0402 | AR |
| 69 | 23013A077-3 | | MINCOM | SHIM-TAPE GUIDE, .010 THK | | 83-3230-0403 | AR |
| 70 | 23013A077-4 | | MINCOM | SHIM-TAPE GUIDE, .020 THK | | 83-3230-0404 | AR |
| 65 | 23013A013-1 | D | MINCOM | TAPE GUIDE-INCOMING,1/4 IN | 11 | 83-3240-0326 | 2.0 |
| 66 | 23013A014-1 | C | MINCOM | TAPE GUIDE-OUTGOING,1/4 IN | 11 | 83-3240-0332 | 2.0 |

PARTS LIST — PL 23013A915 — REV C

TITLE KIT-TAPE GUIDE,1/2 IN,1/2 CAP — CATALOG NO. 83-5990-0429

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 67 | 23013A077-1 | MINCOM | SHIM-TAPE GUIDE,.002 THK | | 83-3230-0401 | AR |
| 68 | 23013A077-2 | MINCOM | SHIM-TAPE GUIDE,.005 THK | | 83-3230-0402 | AR |
| 69 | 23013A077-3 | MINCOM | SHIM-TAPE GUIDE, .010 THK | | 83-3230-0403 | AR |
| 70 | 23013A077-4 | MINCOM | SHIM-TAPE GUIDE, .020 THK | | 83-3230-0404 | AR |
| 65 | 23013A013-2 D | MINCOM | TAPE GUIDE-INCOMNG,1/2 IN TAPE | 11 | 83-3240-0327 | 2.0 |
| 66 | 23013A014-2 C | MINCOM | TAPE GUIDE-OUTGNG, 1/2 IN TAPE | 11 | 83-3240-0333 | 2.0 |

P A R T S   L I S T        PL 23013B920        REV D

TITLE  KIT-TAPE GUIDE, 1 INCH        CATALOG NO. 83-5990-0558

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C3 | BR500-25 | | CORNELL DUBL | CAP-FXD,ELECT, 500UF 25V | 83-1510-2044 | 1.0 |
| K13 | KHP17D11 | | POTTR & BRUM | RELAY-4PDT,650 OHM 24VDC 3 AMP | 83-1550-3550 | 1.0 |
| 65 | 23013A013-4 | D | MINCOM | TAPE GUIDE-INCOMING, 1 IN | 83-3240-0331 | 2.0 |
| 66 | 23013A014-4 | C | MINCOM | TAPE GUIDE-OUTGOING, 1 IN | 83-3240-0335 | 2.0 |
| 67 | 23013A077-1 | | MINCOM | SHIM-TAPE GUIDE,.002 THK | 83-3230-0401 | AR |
| 68 | 23013A077-2 | | MINCOM | SHIM-TAPE GUIDE,.005 THK | 83-3230-0402 | AR |
| 69 | 23013A077-3 | | MINCOM | SHIM-TAPE GUIDE, .010 THK | 83-3230-0403 | AR |
| 70 | 23013A077-4 | | MINCOM | SHIM-TAPE GUIDE, .020 THK | 83-3230-0404 | AR |

PARTS LIST PL 23013A930 REV C

TITLE KIT-TAPE GUIDE,1/4 IN,1 IN CAP CATALOG NO. 83-5990-0431

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 67 | 23013A077-1 | MINCOM | SHIM-TAPE GUIDE,.002 THK | | 83-3230-0401 | AR |
| 68 | 23013A077-2 | MINCOM | SHIM-TAPE GUIDE,.005 THK | | 83-3230-0402 | AR |
| 69 | 23013A077-3 | MINCOM | SHIM-TAPE GUIDE, .010 THK | | 83-3230-0403 | AR |
| 70 | 23013A077-4 | MINCOM | SHIM-TAPE GUIDE, .020 THK | | 83-3230-0404 | AR |
| 65 | 23013A013-5 | D MINCOM | TAPE GUIDE-INC,1/4 IN TAPE | 11 | 83-3240-0396 | 2.0 |
| 66 | 23013A014-5 | C MINCOM | TAPE GUIDE-OUTGOING,1/4 IN | 11 | 83-3240-0398 | 2.0 |

P A R T S   L I S T                PL 23013A935        REV C

TITLE  KIT-TAPE GUIDE,1/2 IN,1 IN CAP        CATALOG NO. 83-5990-0432

---------------- M A T E R I A L   R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|---|
| 67 | 23013A077-1 | | MINCOM | SHIM-TAPE GUIDE,.002 THK | | 83-3230-0401 | AR |
| 68 | 23013A077-2 | | MINCOM | SHIM-TAPE GUIDE,.005 THK | | 83-3230-0402 | AR |
| 69 | 23013A077-3 | | MINCOM | SHIM-TAPE GUIDE, .010 THK | | 83-3230-0403 | AR |
| 70 | 23013A077-4 | | MINCOM | SHIM-TAPE GUIDE, .020 THK | | 83-3230-0404 | AR |
| 65 | 23013A013-6 | D | MINCOM | TAPE GUIDE-INC,1/2 IN TAPE | 11 | 83-3240-0397 | 2.0 |
| 66 | 23013A014-6 | C | MINCOM | TAPE GUIDE-OUTGOING,1/2 IN | 11 | 83-3240-0399 | 2.0 |

PARTS LIST PL 23013B940 REV B

TITLE KIT-SPEED, 3 3/4-7 1/2 IPS CATALOG NO. 83-5990-0559

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C010-1 | F MINCOM | MOTOR ASSY-CAPSTAN,3 3/4-7 1/2 | 83-4560-0149 | 1.0 |
| 7 | 23007A016 | B MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 9 | MS16998-27 | MIL STD | SCREW-CAP,SOC HD,10-32 X 1/2 | 83-9261-2101 | 4.0 |
| 10 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A061 | D MINCOM | FLYWHEEL-CAPSTAN,MODEL 23 | 83-3220-0146 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 15 | 23007A023-2 | C MINCOM | CAP-IDLER,REVERSING,PLAIN | 83-3250-0108 | 1.0 |

TITLE KIT-SPEED, 7 1/2-15 IPS    CATALOG NO. 83-5990-0560

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C010-2 | F MINCOM | MOTOR ASSY-CAPSTAN,7 1/2-15 | 83-4560-0150 | 1.0 |
| 7 | 23007A016 | B MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 8 | 23007A014-1 | B MINCOM | SPACER-MOTOR MTG,7 1/2-15 IPS | 83-3230-0311 | 1.0 |
| 9 | MS16998-28 | MIL STD | SCREW-CAP,SOC HD,10-32 X 5/8 | 83-9261-2102 | 4.0 |
| 10 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A061 | D MINCOM | FLYWHEEL-CAPSTAN,MODEL 23 | 83-3220-0146 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 15 | 23007A023-2 | C MINCOM | CAP-IDLER,REVERSING,PLAIN | 83-3250-0108 | 1.0 |

PARTS LIST PL 23013B945-2 REV C

TITLE KIT-SPEED,7 1/2-15 IPS,50 CYC CATALOG NO. 83-5990-0582

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C010-4 | F MINCOM | MOTOR ASSY-CAPSTAN,50 CYCLE | 83-4560-0158 | 1.0 |
| 7 | 23007A016 | B MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 8 | 23007A014-1 | B MINCOM | SPACER-MOTOR MTG,7 1/2-15 IPS | 83-3230-0311 | 1.0 |
| 9 | MS16998-28 | MIL STD | SCREW-CAP,SOC HD,10-32 X 5/8 | 83-9261-2102 | 4.0 |
| 10 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A061 | D MINCOM | FLYWHEEL-CAPSTAN,MODEL 23 | 83-3220-0146 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 15 | 23007B023 | A MINCOM | CAP-CAPSTAN STROBE, 50 HZ | 83-3250-0183 | 1.0 |

PARTS LIST   PL 23013B950-1   REV C

TITLE KIT-SPEED, 15-30 IPS   CATALOG NO. 83-5990-0561

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C010-3 | F MINCOM | MOTOR ASSY-CAPSTAN,15-30 | 83-4560-0151 | 1.0 |
| 7 | 23007A016 | B MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 8 | 23007A014-2 | B MINCOM | SPACER-MOTOR MTG, CAPSTAN | 83-3230-0312 | 1.0 |
| 9 | MS16998-29 | MIL STD | SCREW-CAP,SOC HD,10-32 X 3/4 | 83-9261-2103 | 4.0 |
| 10 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A061 | D MINCOM | FLYWHEEL-CAPSTAN,MODEL 23 | 83-3220-0146 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 15 | 23007A023-2 | C MINCOM | CAP-IDLER,REVERSING,PLAIN | 83-3250-0108 | 1.0 |

PARTS LIST    PL 230138950-2    REV C

TITLE KIT-SPEED,15-30 IPS,50 CYCLE    CATALOG NO. 83-5990-0581

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 6 | 23007C010-5 | F | MINCOM | MOTOR ASSY-CAPSTAN,15-30,50 CY | 83-4560-0159 | 1.0 |
| 7 | 23007A016 | B | MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 8 | 23007A014-3 | A | MINCOM | SPACER-MOTOR MTG,CAPSTAN | 83-3230-0469 | 1.0 |
| 9 | MS16998-29 | | MIL STD | SCREW-CAP,SOC HD,10-32 X 3/4 | 83-9261-2103 | 4.0 |
| 10 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A061 | D | MINCOM | FLYWHEEL-CAPSTAN,MODEL 23 | 83-3220-0146 | 1.0 |
| 13 | 19007A022 | D | MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | | SCR-CAP,FH,1/4X20X5/8,NYLOC | 83-9262-0569 | 1.0 |
| 15 | 23007B023 | A | MINCOM | CAP-CAPSTAN STROBE, 50 HZ | 83-3250-0183 | 1.0 |

PARTS LIST  PL 23013B955  REV C

TITLE KIT-SPEED, 30-60 IPS  CATALOG NO. 83-5990-0562

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C410-1 | B MINCOM | MOTOR ASSY-CAPSTAN, 30-60 | 83-4560-0152 | 1.0 |
| 7 | 23007A016 | B MINCOM | SHIELD-CAPSTAN MOTOR,MODEL 23 | 83-3650-0363 | 1.0 |
| 9 | MS16998-27 | MIL STD | SCREW-CAP,SOC HD,10-32 X 1/2 | 83-9261-2101 | 4.0 |
| 10 | | | WASHER-FLAT,GENFRAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A461 | E MINCOM | FLYWHEEL-CAPSTAN, 120 IPS | 83-3220-0171 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCREW-SELF LOCK,FH,1/4-20 X3/4 | 83-9262-0204 | 1.0 |
| 15 | 23007A023-2 | C MINCOM | CAP-IDLER,REVERSING,PLAIN | 83-3250-0108 | 1.0 |

PARTS LIST    PL 23013B960    REV C

TITLE KIT-SPEED, 60-120 IPS    CATALOG NO. 83-5990-0563

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | 23007C410-2 | B MINCOM | MOTOR ASSY-CAPSTAN, 60-120 | 83-4560-0153 | 1.0 |
| 9 | MS16998-27 | MIL STD | SCREW-CAP,SOC HD,10-32 X 1/2 | 83-9261-2101 | 4.0 |
| 10 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 4.0 |
| 11 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 4.0 |
| 12 | 23007A461 | E MINCOM | FLYWHEEL-CAPSTAN, 120 IPS | 83-3220-0171 | 1.0 |
| 13 | 19007A022 | D MINCOM | CAP-FLYWHEEL,PRECISION PLATE | 83-3250-0082 | 1.0 |
| 14 | | | SCREW-SELF LOCK,FH,1/4-20 X3/4 | 83-9262-0204 | 1.0 |
| 15 | 23007A023-2 | C MINCOM | CAP-IDLER,REVERSING,PLAIN | 83-3250-0108 | 1.0 |

P A R T S   L I S T　　　PL 23013A970　　　REV D

TITLE KIT-BRAKE, CAPSTAN,HIGH SPEED　　　CATALOG NO. 83-5990-0438

---------------- M A T E R I A L   R E Q U I R E M E N T S ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C71 | 36D552G025AB | SPRAGUE | CAP-FXD,ELECT,5500 UF 25 V | 83-1510-2171 | 1.0 |
| C72 | 200P1904 | SPRAGUE | CAP-FXD,ELEC,5 MF 370VAC 10% | 83-1510-2243 | 1.0 |
| L6 | 42C115DC-AX | PHILLIPS CON | SOLENOID-LINEAR, 115 VOLTS | 83-1550-4517 | 1.0 |
| 1 | 36-909H | SPRAGUE | BRACKET-CAPACITOR MTG | 83-1320-1587 | 2.0 |
| 2 | 21FK-832 | STD PRSD STL | NUT-HEX,SELF LOCK,8-32 X.345WD | 83-9260-2405 | 2.0 |
| 3 | | | SCREW-MACH,PAN HD,8-32 X 9/16 | 83-9260-4552 | 2.0 |
| 4 | MS27183-7 | MIL STD | WASHER-FLAT,RD,#8,GEN PURPOSE | 83-9261-4038 | 2.0 |
| 5 | 60510-4 | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 1.0 |
| 6 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 1.0 |
| 76 | AN742D-22 | | CLAMP-LOOP,CABLE SPT,2.047 LG | 83-1650-0393 | 2.0 |
| 77 | | | NUT-HEX,SM PATT,8-32 X .313 WD | 83-9260-2203 | 2.0 |
| 78 | MS35206-245 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/2 | 83-9260-4551 | 2.0 |
| 79 | | | WASHER-FLAT,SM PATT,#8 | 83-9261-4035 | 2.0 |
| 80 | | | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4306 | 2.0 |
| 81 | 23013B065 E | MINCOM | DELAY RELAY ASSY-3 RELAYS | 83-4930-1478 | 1.0 |
| 82 | MS35207-263 | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 2.0 |
| 83 | RAA-217 | THOM & BETTS | SPLICE-CONDUCTOR,BUTT TYPE | 83-9630-0382 | 12.0 |
| 86 | 23013A403 A | MINCOM | ADAPTER-SOLENOID,BRAKE, | 83-3240-0365 | 1.0 |
| 87 | 23013A402 B | MINCOM | BRACKET-SUPPORT,BRAKE,120 IPS | 83-3320-1293 | 1.0 |
| 88 | 23013A404 C | MINCOM | PAD-BRAKE,CAPSTAN MOTOR,120 | 83-3350-0452 | 1.0 |
| 89 | 21-S-094-0437 | STD PRSD STL | PIN-SPRING, .094 DIAX.437LG | 83-7280-0223 | 1.0 |
| 90 | MS16998-27 | MIL STD | SCREW-CAP,SOC HD,10-32 X 1/2 | 83-9261-2101 | 2.0 |
| 91 | | | SCREW-SHC, 8-32X1/4 | 83-9261-2057 | 2.0 |
| 92 | | | WASHER-FLAT,SM PATT,#8 | 83-9261-4035 | 2.0 |
| 93 | | | WASHER-FLAT,SM PATT,#10 | 83-9261-4046 | 2.0 |
| 94 | | | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4306 | 2.0 |
| 95 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 2.0 |
| 96 | 23013A405 A | MINCOM | SPRING-RETURN,SOLENOID,BRAKE | 83-3280-0567 | 1.0 |

PARTS LIST PL 23013A986 REV A

TITLE BASE-REEL HUB,1/4 CINE TOP HAT CATALOG NO. 83-3240-0455

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23013A160 | A MINCOM | HUB ASSY-REEL, 1/4 IN TAPE | 83-4930-1884 | 1.0 |
| 2 | 04020.108 | H MINCOM | STANDOFF-CHASSIS MTG, .875 LG | 83-3350-0022 | 1.0 |
| 3 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 1.0 |
| 4 | | | SCREW-MACH,BIND H, 6-32 X 3/8 | 83-9260-4294 | 1.0 |

P A R T S   L I S T          PL 23013B990          REV G

TITLE  KIT-COMMON PARTS,TAPE DECK          CATALOG NO. 83-5990-0564

- - - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| DS1,DS2,DS3,DS4,DS5,DS6 | 327 | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 6.0 |
| DS8 | 1820 | GE | LAMP-INCANDESCENT, 28 V,.10 A | 83-1550-2602 | 1.0 |
| F1 | 313005. | LITTELFUSE | FUSE-SLO-BLO,125V 5 AMP | 83-7550-8006 | 1.0 |
| L1,L2 | 42C24DC-AX | PHILLIPS CON | SOLENOID-ELECTRICAL,PUSH/PULL | 83-1550-4516 | 2.0 |
| L3 | 128281 | G.H. LELAND | SOLENOID-115 VDC | 83-1550-4515 | 1.0 |
| L4 | 128264-001 | LEDEX | SOLENOID-ROTARY | 83-1550-4514 | 1.0 |
| L5 | 42C24DC-AU | PHILLIPS CON | SOLENOID-ELECTRICAL,PUSH/PULL | 83-1550-4513 | 1.0 |
| 101 | 23013A002 L | MINCOM | PLATE-TAPE DECK,TRANSPORT | 83-3320-1027 | 1.0 |
| 102 | GP67-125X500-12 | GROOV-PIN | PIN-GRVD,HDLS, .125 DIAX.500LG | 83-7280-0202 | 3.0 |
| 103 | GP7-125X1000-12 | GROOV-PIN | PIN-GRVD,HDLS,.125 X 1.000 LG | 83-7280-0212 | 1.0 |
| 104 | GP4-125X0500-12 | GROOV-PIN | PIN-GRND,HDLS, .125 DIAX.500LG | 83-7280-0484 | 3.0 |
| 106 | AMF5DD-FS160 | FAFNIR | BRG-BALL,ANLR,FLNGD,.3125 BORE | 83-1230-0178 | 6.0 |
| 107 | 23013A035 B | MINCOM | SHAFT-ARM,IDLER,TAPE TRANSPORT | 83-3280-0407 | 2.0 |
| 108 | 23013B036 A | MINCOM | SHAFT-MTG, TAPE LIFTER | 83-3280-0536 | 1.0 |
| 109 | RF51624 | PALNUT | NUT-HEX,STMPD,5/16-24 X .500WD | 83-9260-2404 | 3.0 |
| 114 | 1126 | BIRNBACH | SPACER-RD,#6 SCREW SIZE,.375LG | 83-9350-0099 | 2.0 |
| 115 | 23013A067 B | MINCOM | ARM-ACTUATOR, TAPELIFTER | 83-3210-0253 | 1.0 |
| 116 | 23013A028 D | MINCOM | BRACKET-MTG,SOLENOID,TPE TRANS | 83-3320-1107 | 1.0 |
| 117 | 23013A011 D | MINCOM | BRACKET-MTG,SOLENOID,RH | 83-3320-1108 | 1.0 |
| 118 | 23013A048 A | MINCOM | BRACKET-SOLENOID MTG,CAPSTAN | 83-3320-1159 | 1.0 |
| 119 | 23013A047 A | MINCOM | BRACKET-SOLENOID MTG,TAPE LIFT | 83-3320-1167 | 1.0 |
| 120 | 23013A025 A | MINCOM | SUPPORT-DASHPOT,DOOR,HEAD COVR | 83-3340-0382 | 1.0 |
| 121 | 23013A055 A | MINCOM | SPACER-COVER PLATE,TRANSPORT | 83-3350-0414 | 2.0 |
| 122 | TRUARC | MIL STD | RING-RETAINING,EXT,.225 I.D. | 83-7270-0118 | 1.0 |
| 123 | #775 | H.H. SMITH | CLAMP-CABLE,NYLON,.479 DIA | 83-7650-0058 | 1.0 |
| 125 | MS35206-241 | MIL STD | SCREW-MACH,PAN HD,8-32 X 1/4 | 83-9260-4547 | 1.0 |
| 126 | MS35206-243 | MIL STD | SCREW-MACH,PAN HD,8-32 X 3/8 | 83-9260-4549 | 1.0 |
| 127 | MS51017-26 | MIL STD | SETSCREW-CUP PT,6-32 X 1/2 | 83-9261-0051 | 2.0 |
| 128 | | | SCREW-SHC, 8-32X1/4 | 83-9261-2057 | 4.0 |
| 129 | MS16998-26 | MIL STD | SCREW-CAP,SOC HD,10-32 X 3/8 | 83-9261-2100 | 2.0 |
| 136 | 23013A045 A | MINCOM | SPACER-PWR SUP MTG,1.430 LG | 83-3350-0412 | 1.0 |
| 137 | 23013B080 C | MINCOM | CHASSIS ASSY-WRAP AROUND,TRANS | 83-5920-1332 | 1.0 |
| 138 | MS35206-217 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/2 | 83-9260-4517 | 4.0 |
| 139 | MS35206-237 | MIL STD | SCREW-MACH,PAN HD,6-32 X 1.750 | 83-9260-4544 | 1.0 |
| 140 | 23013A172 B | MINCOM | BRACKET ASSY-PHOTOCELL | 83-4320-1679 | 1.0 |
| 146 | 23013A044 A | MINCOM | SPRING-RETURN,IDLER ARM,CAPSTN | 83-3280-0422 | 3.0 |
| 147 | 23007A054 A | MINCOM | SPRING-SHOCK ABSORBING-IDLER | 83-3280-0542 | 1.0 |
| 148 | 23013A090-1 A | MINCOM | ARM ASSY-IDLER,ROLLER,LH | 83-4210-0230 | 1.0 |
| 149 | 23013A090-2 A | MINCOM | ARM ASSY-IDLER,ROLLER,RH | 83-4210-0231 | 1.0 |

TITLE KIT-COMMON PARTS,TAPE DECK CATALOG NO. 83-5990-0564

- - - - - - - - - - - - - - - - - M A T E R I A L R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 150 | 23007A050-1 K | MINCOM | ARM ASSY-IDLER, ACTUATING,RH | 83-4210-0232 | 1.0 |
| 151 | 23007A050-2 K | MINCOM | ARM ASSY-IDLER,ACTUATING,LH | 83-4210-0256 | 1.0 |
| 152 | | RUBBERCRAFT | BUMPER-RUB,SLV,.125 ID X .313 | 83-7230-0337 | 1.0 |
| 153 | | MIL STD | RING-RETAINING,TYPE E,1/4 ID | 83-7270-0413 | 2.0 |
| 154 | 21-S-094-0437 | STD PRSD STL | PIN-SPRING, .094 DIAX.437LG | 83-7280-0223 | 3.0 |
| 155 | 6593 | BIRNBACH | INSULATOR-WASH, NYLON,.016 TK | 83-9630-0272 | 5.0 |
| 156 | 23013A074 B | MINCOM | BUMPER-RUB SLV,.06 ID X .310LG | 83-3230-0390 | 1.0 |
| 157 | 23013A073 A | MINCOM | SPACER-MACHINED,DAMPENER,TEF | 83-3230-0391 | 1.0 |
| 161 | 303-85-15-1.25 | ELEC REGULTR | DASHPOT-AIR DAMPINING CYLINDER | 83-1270-0491 | 1.0 |
| 162 | 23013A046 C | MINCOM | ARM-DAMPENING,IDLER | 83-3210-0223 | 1.0 |
| 163 | 5555-12 | TRUARC | RING-RETNG, EXT, .120 ID | 83-7270-0503 | 3.0 |
| 166 | 303-85-15-1000 | ELEC REGULTR | DASHPOT-AIR DAMPINING CYLINDER | 83-1270-0490 | 1.0 |
| 167 | 23013A095 B | MINCOM | ARM ASSY-ACTUATOR,DOOR HD CVR | 83-4210-0237 | 1.0 |
| 171 | MS35206-213 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 3.0 |
| 172 | | | SETSCREW-LGLK,HEX,CUP,10-32X1. | 83-9261-0271 | 1.0 |
| 174 | J-7219-8 | LORD | MOUNT-RESILIENT,RUBBER | 83-1320-1096 | 1.0 |
| 175 | 23013A068 A | MINCOM | BRACKET-VERTICAL MTG,TRANSPORT | 83-3320-1675 | 1.0 |
| 177 | 23007A070 C | MINCOM | BRKT ASSY-MOTOR MTG,CAPS DRIVE | 83-4320-1476 | 1.0 |
| 178 | 23012A000 A | MINCOM | BRACKET ASSY-VERNIER SPEED ADJ | 83-4930-1002 | 1.0 |
| 179 | MS16998-31 | MIL STD | SCREW-SHC, 10-32X1 | 83-9261-2105 | 1.0 |
| 180 | NAS1352-06 | NYLOK CORP | SCREW-CAP,SOC HD,6-32 X 1.00 | 83-9261-2135 | 1.0 |
| 181 | MS35690-602 | MIL STD | NUT-HEX,PLAIN,3/8-16 X .563 WD | 83-9260-2011 | 1.0 |
| 182 | AN960-616 | AN STANDARD | WASHER-FLAT,GENERAL PURP,#3/8 | 83-9261-4015 | 1.0 |
| 183 | MS35333-42 | MIL STD | WASHER-LOCK,FLAT,INT T,#3/8 | 83-9261-4211 | 1.0 |
| 186 | 01123060 | REVERE | HUB ASSY-REEL,MODEL 23 | 83-1930-0959 | 2.0 |
| 188 | 23004A000 F | MINCOM | MOTOR ASSY-TAKE UP REEL | 83-4560-0090 | 1.0 |
| 189 | 23004A050 B | MINCOM | MOTOR ASSY-REWIND,REEL | 83-4560-0092 | 1.0 |
| 191 | 23013A085 A | MINCOM | CONN-PLUG,SHORTING,TAPE TRANS | 83-4610-1136 | 1.0 |
| 192 | 23013B060 G | MINCOM | P.C. BD ASSY-LOGIC TRANSPORT | 83-4930-1716 | 1.0 |
| 196 | 185-1873 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,AMBER | 83-1550-5243 | 1.0 |
| 197 | 185-1872 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,GREEN | 83-1550-5244 | 1.0 |
| 199 | 23013A004 B | MINCOM | COVER-LAMP,DECORATIVE | 83-3310-0833 | 1.0 |
| 200 | 16049A015-3 L | MINCOM | LENS-INDICATOR LIGHT,*REWIND* | 83-3550-1207 | 1.0 |
| 201 | 16049A015-4 L | MINCOM | LENS-INDICATOR LIGHT,*FORWARD* | 83-3550-1208 | 1.0 |
| 202 | 23013A005 C | MINCOM | LENS-LAMP,TAPE SENSOR | 83-3550-1406 | 2.0 |
| 203 | 23013A027 C | MINCOM | LENS-LIGHTED SWITCH,PUSHBUTTON | 83-3550-1408 | 1.0 |
| 204 | 23013A038-1 E | MINCOM | LENS-IND LT,ENGRAVED STOP | 83-3550-1417 | 1.0 |
| 205 | 16049A015-35 L | MINCOM | LENS-INDICATOR LIGHT,*RECORD* | 83-3550-1436 | 1.0 |
| 206 | 16049A015-36 L | MINCOM | LENS-INDICATOR LIGHT,*PLAY* | 83-3550-1437 | 1.0 |
| 207 | DK-153 | GASKET MFG | STRIP-GASKET MATL,3/8 X 1/32 | 83-1190-0073 | 1.0 |
| 208 | | MIL STD | SCREW-MACH,OVAL HD,6-32 X 7/8 | 83-9261-4340 | 4.0 |
| 216 | 17460S | BELDON | CABLE ASSY-PWR,ELEC, 10 FT LG | 83-1570-0303 | 1.0 |



Figure 47. Tape Deck Assembly

P A R T S   L I S T          PL 23013B990          REV G

TITLE .KIT-COMMON PARTS,TAPE DECK          CATALOG NO. 83-5990-0564

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 217 | 23007A001 | A MINCOM | COVER-HEAD,MODEL 23 | 83-3310-0832 | 1.0 |
| 218 | 23013A015 | D MINCOM | COVER-CAPSTAN,RH,DECORATIVE | 83-3310-0834 | 1.0 |
| 219 | 23013A032 | E MINCOM | COVER-CAPSTAN,LH,DECORATIVE | 83-3310-0835 | 1.0 |
| 220 | 23013A007 | B MINCOM | BRACKET-MTG,TAPE DECK | 83-3320-1114 | 2.0 |
| 221 | MS24693-S272 | MIL STD | SCREW-MACH,FH,10-32 X 1/2 | 83-9260-6294 | 8.0 |
| 222 | MS35190-240 | MIL STD | SCREW-MACH,FH,6-32 X 3/4 | 83-9260-6522 | 2.0 |
| 231 | | | NUT-HEX,SM PATT,8-32 X .313 WD | 83-9260-2203 | AR |
| 232 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | AR |
| 233 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | AR |
| 234 | MS35207-261 | MIL STD | SCREW-MACH,PAN HD,10-32 X 3/8 | 83-9260-4570 | AR |
| 235 | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | AR |
| 236 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | AR |
| 237 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | AR |
| 238 | | | WASHER-FLAT,SM PATT,#8 | 83-9261-4035 | AR |
| 239 | | | WASHER-FLAT,SM PATT,#10 | 83-9261-4046 | AR |
| 240 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | AR |
| 241 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | AR |
| 242 | | | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4306 | AR |
| 243 | MS35338-43 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | AR |
| 244 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | AR |
| 245 | 00000A741-3 | E MINCOM | LABEL-IDENT,PATENT, MOD 23 | 83-3550-1500 | 1.0 |
| 246 | 00000A769 | C MINCOM | LABEL-IDENTIFICATION,MODULE | 83-3550-1621 | 1.0 |

P A R T S   L I S T   PL 23017A000   REV B

TITLE CONTROL ASSY-REMOTE,OPTIONAL   CATALOG NO. 83-5920-0823

- - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| DS1,DS2,DS3,DS4,DS5 | 327 | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 5.0 |
| DS6 | 380672-4 | AMP INC | LIGHT ASSY-PILOT,AMBER,24VOLTS | 83-1550-2590 | 1.0 |
| P1 | 201359-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0674 | 1.0 |
| S1,S2,S3,S4,S5 | 1018P | PENDAR | SWITCH-PUSHBUTTON,SPDT,MOMENTY | 83-1550-5177 | 5.0 |
| S6,S7 | 513-0101-604 | DIALCO | SWITCH-MOMENTARY,MAKE | 83-1550-5233 | 2.0 |
| 1 | 23017A001 | MINCOM | PANEL-SWITCH, MODE CONTROL | 83-3360-0975 | 1.0 |
| 2 | 23017A002 | MINCOM | HOUSING-MODE CONTROL | 83-3310-1039 | 1.0 |
| 3 | 23017A003 | C MINCOM | CHASSIS-SWITCH, MODE CONTROL | 83-3310-1040 | 1.0 |
| 4 | 42980-1-LP | 4 AMP INC | PIN-CONTACT,CONN,20-24 GA WIRE | 83-1610-0638 | 15.0 |
| 5 | 42452-1 | AMP INC | CONT-ELECT,SOCKET CLIP,.220 WD | 83-1610-0847 | 2.0 |
| 6 | 201923-1 | AMP INC | CLIP-SPRING TENSION, MALE | 83-1620-0126 | 1.0 |
| 7 | 201229-1 | AMP INC | CLAMP-ELEC,STRAIN REL,.779 MCE | 83-1650-0244 | 1.0 |
| 8 | 00000A769 | C MINCOM | LABEL-IDENTIFICATION,MODULE | 83-3550-1621 | 1.0 |
| 9 | 200389-4 | AMP INC | PIN-GUIDE,CENTER,AMP SERIES M | 83-7280-0196 | 1.0 |
| 10 | TY15 | THOMS & BETS | CLAMP-LOOP,NYLON TYRAP,7.81 LG | 83-7650-0056 | 1.0 |
| 11 | 8748 | BELDEN | WIRE-TYPE 8748, 22 GA,18CONDUC | 83-7910-0534 | AR |
| 12 | 200390-4 | AMP INC | RECP-GUIDE PIN,CENTER,SERIES M | 83-7270-0302 | 1.0 |
| 13 | #7 | RUBBERCRAFT | GROMMET-RUBBER,.375ID X.687 OD | 83-9630-0097 | 1.0 |
| 14 | MS35206-229 | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 5.0 |
| 15 | MS24693-S25 | MIL STD | SCREW-MACH,FH,6-32 X 5/16 | 83-9260-6555 | 2.0 |
| 16 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 5.0 |
| 17 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 5.0 |
| 18 | 16049A015-3 | L MINCOM | LENS-INDICATOR LIGHT,*REWIND* | 83-3550-1207 | 1.0 |
| 19 | 16049A015-4 | L MINCOM | LENS-INDICATOR LIGHT,*FORWARD* | 83-3550-1208 | 1.0 |
| 20 | 16049A015-35 | L MINCOM | LENS-INDICATOR LIGHT,*RECORD* | 83-3550-1436 | 1.0 |
| 21 | 16049A015-36 | L MINCOM | LENS-INDICATOR LIGHT,*PLAY* | 83-3550-1437 | 1.0 |
| 22 | 23013A038-1 | E MINCOM | LENS-IND LT,ENGRAVED STOP | 83-3550-1417 | 1.0 |
| 23 | 185-1873 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,AMBER | 83-1550-5243 | 1.0 |
| 24 | 185-1872 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,GREEN | 83-1550-5244 | 1.0 |

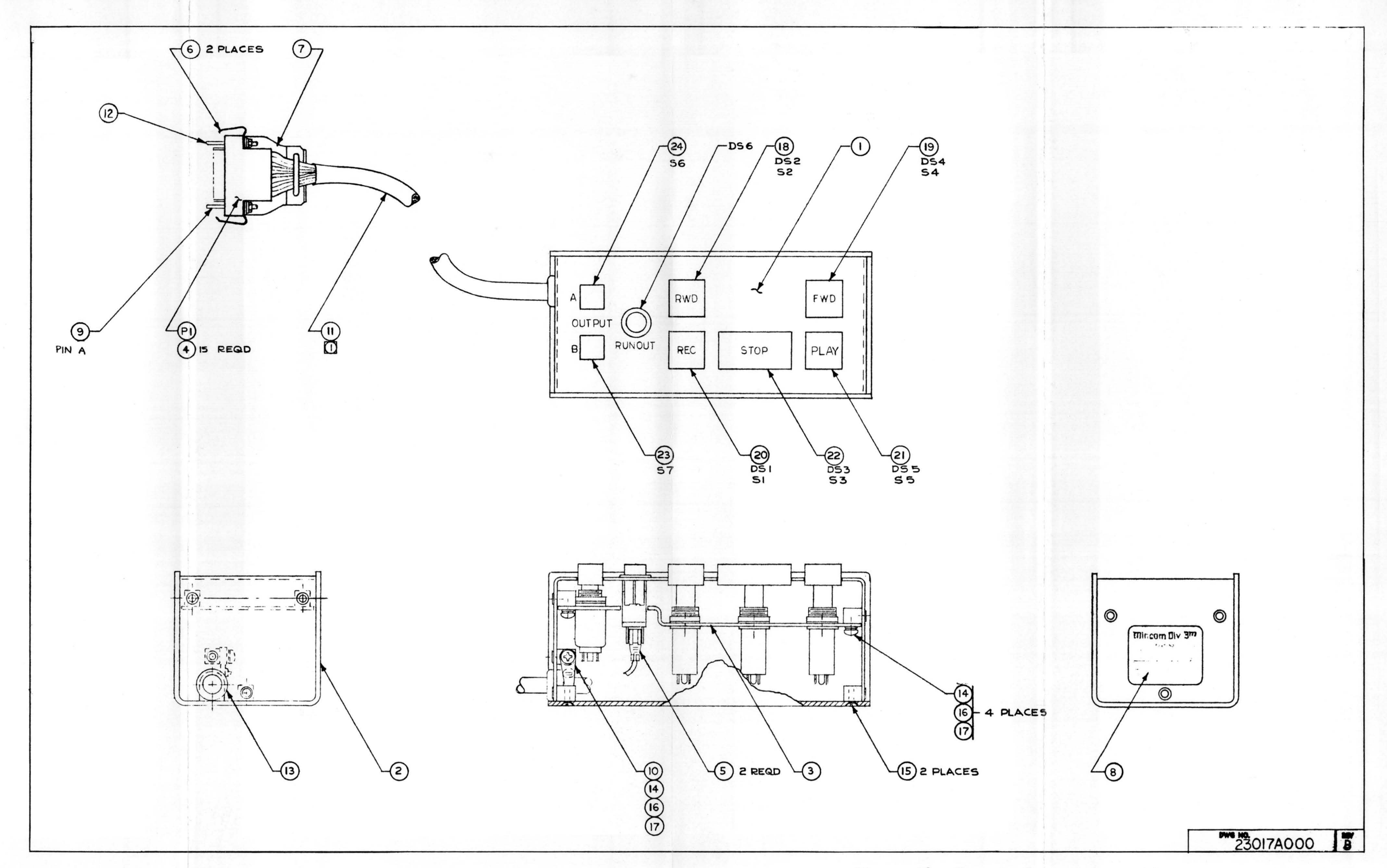



Figure 48. Remote Control Assembly

PARTS LIST　　PL 23017A010　　REV A

TITLE CABLE ASSY-EXT,REMOTE CONTROL　　CATALOG NO. 83-4570-0428

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| J1 | 200512-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0663 | 1.0 |
| P1 | 201359-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0674 | 1.0 |
| 3 | 42980-1-LP 4 | AMP INC | PIN-CONTACT,CONN,20-24 GA WIRE | 83-1610-0688 | 18.0 |
| 4 | 42981-1-LP 4 | AMP INC | SOCKET-CONTACT,CONN, SIZE 16 | 83-1610-0689 | 18.0 |
| 5 | 201923-1 | AMP INC | CLIP-SPRING TENSION, MALE | 83-1620-0126 | 1.0 |
| 6 | 201924-1 | AMP INC | CLIP-SPG TENS,POSITION LOCKING | 83-1620-0127 | 1.0 |
| 7 | 201229-1 | AMP INC | CLAMP-ELEC,STRAIN REL,.779 MCE | 83-1650-0244 | 2.0 |
| 8 | 200390-4 | AMP INC | RECP-GUIDE PIN,CENTER,SERIES M | 83-7270-0302 | 2.0 |
| 9 | 200389-4 | AMP INC | PIN-GUIDE,CENTER,AMP SERIES M | 83-7280-0196 | 2.0 |
| 10 | 8748 | BELDEN | WIRE-TYPE 8748, 22 GA,18CONDUC | 83-7910-0534 | 25.0 |

PARTS LIST  PL 23017A100  REV B

TITLE CONTROL ASSY-REMOTE,SYNC  CATALOG NO. 83-5920-1493

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 1.0 |
| CR1,CR2 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 2.0 |
| DS1,DS2,DS3,DS4,DS5 | 327 | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 5.0 |
| DS6 | 380672-4 | AMP INC | LIGHT ASSY-PILOT,AMBER,24VOLTS | 83-1550-2590 | 1.0 |
| DS7,DS8,DS9,DS10,DS11,DS12, DS13,DS14,DS15,DS16,DS17, DS18,DS19,DS20,DS21,DS22 | L-28/40 | MURA | LAMP-PANEL ASSY, 28 V 40 MA | 83-1550-2603 | 16.0 |
| P1 | 201359-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0674 | 1.0 |
| P2 | 200512-3 | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0663 | 1.0 |
| R1 | 0A781-7220 | MINCOM SPEC | RES-FXD,FILM,220 OHM,1/2W,2% S | 83-1520-7220 | 1.0 |
| S1,S2,S3,S4,S5 | 1018P | PENDAR | SWITCH-PUSHBUTTON,SPDT,MOMENTY | 83-1550-5177 | 5.0 |
| S6,S7 | 513-0101-604 | DIALCO | SWITCH-MOMENTARY,MAKE | 83-1550-5233 | 2.0 |
| S8,S9,S10,S11,S12,S13,S14, S15 | 1454 | CENTRALAB | SWITCH-LEVER,WAFER TYPE,2P3POS | 83-1550-0031 | 8.0 |
| S16 | DP7 | TORSION BAL | SWITCH-TOGGLE,DPDT,5 AMP | 83-1550-5061 | 1.0 |
| 1 | 23017A101 | B MINCOM | PANEL-FRONT,CONT,REMOTE SYNC | 83-3360-1206 | 1.0 |
| 2 | 23017A102 | A MINCOM | HOUSING-CONT,REMOTE SYNC | 83-3310-1248 | 1.0 |
| 3 | 23017A003 | C MINCOM | CHASSIS-SWITCH, MODE CONTROL | 83-3310-1040 | 1.0 |
| 4 | 00000A773-1 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #1 | 83-3270-0664 | 1.0 |
| 5 | 00000A773-2 | A MINCOM | KNOB-SWITCH LEVER, STAMPED #2 | 83-3270-0665 | 1.0 |
| 6 | 00000A773-3 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #3 | 83-3270-0666 | 1.0 |
| 7 | 00000A773-4 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #4 | 83-3270-0667 | 1.0 |
| 8 | 00000A773-5 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #5 | 83-3270-0668 | 1.0 |
| 9 | 00000A773-6 | A MINCOM | KNOB-SWITCH LEVER, STAMPED #6 | 83-3270-0669 | 1.0 |
| 10 | 00000A773-7 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #7 | 83-3270-0670 | 1.0 |
| 11 | 00000A773-8 | A MINCOM | KNOB-SWITCH LEVER,STAMPED #8 | 83-3270-0671 | 1.0 |
| 12 | 16049A015-3 | L MINCOM | LENS-INDICATOR LIGHT,*REWIND* | 83-3550-1207 | 1.0 |
| 13 | 16049A015-4 | L MINCOM | LENS-INDICATOR LIGHT,*FORWARD* | 83-3550-1208 | 1.0 |
| 14 | 16049A015-35 | L MINCOM | LENS-INDICATOR LIGHT,*RECORD* | 83-3550-1436 | 1.0 |
| 15 | 16049A015-36 | L MINCOM | LENS-INDICATOR LIGHT,*PLAY* | 83-3550-1437 | 1.0 |
| 16 | 23013A038-1 | E MINCOM | LENS-IND LT,ENGRAVED STOP | 83-3550-1417 | 1.0 |
| 17 | 185-1873 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,AMBER | 83-1550-5243 | 1.0 |
| 18 | 185-1872 | DIALCO | LENS-CAP ASSY,1/2 IN SQ,GREEN | 83-1550-5244 | 1.0 |
| 19 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 4.0 |
| 20 | 42980-1-LP | 4 AMP INC | PIN-CONTACT,CONN,20-24 GA WIRE | 83-1610-0688 | 18.0 |
| 21 | 42452-1 | AMP INC | CONT-ELECT,SOCKET CLIP,.220 WD | 83-1610-0847 | 2.0 |
| 22 | 201923-1 | AMP INC | CLIP-SPRING TENSION, MALE | 83-1620-0126 | 1.0 |

TITLE CONTROL ASSY-REMOTE,SYNC   CATALOG NO. 83-5920-1493

- - - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 23 | 201229-1 | AMP INC | CLAMP-ELEC,STRAIN REL,.779 MCE | 83-1650-0244 | 2.0 |
| 24 | 00000A662-1 C | MINCOM | LABEL-IDENT,ASSY | 83-3550-1276 | 1.0 |
| 25 | 200389-4 | AMP INC | PIN-GUIDE,CENTER,AMP SERIES M | 83-7280-0196 | 2.0 |
| 26 | MS35206-227 | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 4.0 |
| 27 | 8748 | BELDEN | WIRE-TYPE 8748, 22 GA,18CONDUC | 83-7910-0534 | AR |
| 28 | 200390-4 | AMP INC | RECP-GUIDE PIN,CENTER,SERIES M | 83-7270-0302 | 1.0 |
| 29 | SR-9P-1 | HEYMAN | BUSHING-STRAIN RELIEF, CABLE | 83-1690-0337 | 1.0 |
| 30 | 8070-E | LERCO | SPACER-SLV, HEX, TAP, .500 LG | 83-9350-0063 | 2.0 |
| 31 | 3935-10 | CAMBION | SPACER-THD 6-32 .250 HEX 7/8 L | 83-9350-0580 | 2.0 |
| 32 | C12008-020 | TINNERMAN | NUT-SHEET SPRING, | 83-9260-0115 | 16.0 |
| 33 | | MURA | LENS-CAP, INDICATOR, GREEN | 83-1550-1618 | 8.0 |
| 34 | | MURA | LENS-INDICATOR LIGHT, CAP, RED | 83-1550-1616 | 8.0 |
| 35 | MS24693-S24 | MIL STD | SCREW-MACH,FH,6-32 X .250 100 | 83-9260-6571 | 20.0 |
| 36 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 4.0 |
| 37 | | 3M | BUMPER-RUB,ADHESIVE MTG,.50 SQ | 83-1230-0449 | 4.0 |
| 38 | 42981-1-LP 4 | AMP INC | SOCKET-CONTACT,CONN, SIZE 16 | 83-1610-0689 | 18.0 |
| 39 | 201924-1 | AMP INC | CLIP-SPG TENS,POSITION LOCKING | 83-1620-0127 | 1.0 |

P A R T S   L I S T        PL 23028A020        REV E

TITLE  CONSOLE ASSY-CAB, BASIC        CATALOG NO. 83-4310-0998

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | | | ALLMETAL | PIN-DOWEL .250 X 1.250 | 83-1280-0225 | 2.0 |
| 2 | 23028A010 | A | MINCOM | HINGE-PIVOT, CABINET, CONSOLE | 83-3270-0560 | 2.0 |
| 3 | 23028A035-1 | D | MINCOM | CABINET-ENCLOS,CONSLE,WAL VEN | 83-3310-0840 | 1.0 |
| 4 | 23028A002 | A | MINCOM | BRKT-MTG, CABINET | 83-3320-1415 | 2.0 |
| 5 | 23028A043 | | MINCOM | BRKT-SUP, CABINET | 83-3320-1420 | 1.0 |
| 6 | 23028A001 | A | MINCOM | TRIM-BAR, CABINET | 83-3330-0314 | 1.0 |
| 7 | 00000A759 | | MINCOM | PLATE NAME UNIVERSAL | 83-3330-0336 | 1.0 |
| 8 | 23028A005 | C | MINCOM | SUPPORT-TRANSPORT, CABINET | 83-3340-0500 | 1.0 |
| 9 | 23028A044 | A | MINCOM | SPACER-PLATE, TRANSPORT SUP | 83-3350-0474 | 2.0 |
| 10 | 23028A015-1 | B | MINCOM | PANEL-FILLER,CABINET | 83-3360-0932 | 1.0 |
| 11 | 00000A627-10 | S | MINCOM | LABEL-I.D.,M-23,PROFFESION REC | 83-3550-1482 | 1.0 |
| 12 | MS35649-42 | | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 3.0 |
| 14 | MS35649-82 | | MIL STD | NUT-HEX,PLAIN,8-32 X .344 WD | 83-9260-2006 | 4.0 |
| 15 | MS24693-S51 | | MIL STD | SCREW-MACH,FH,8-32 X .625 | 83-9260-6563 | 4.0 |
| 16 | MS24693-S6 | | MIL STD | SCREW-MACH,FH,4-40 X 1/2 | 83-9260-6572 | 3.0 |
| 17 | MS35338-42 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 4.0 |
| 18 | AN960-4L | | A&N STD | WASHER-FLAT,LIGHT SERIES,#4 | 83-9261-4024 | 3.0 |
| 20 | AN960-8L | | A&N STD | WASHER-FLAT,LIGHT SERIES,#8 | 83-9261-4042 | 14.0 |
| 22 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 3.0 |
| 24 | | | | SCREW-WOOD, RND HD #8 X 7/8 | 83-9262-0556 | 4.0 |
| 25 | | | | SCREW-WOOD, RND HD #8 X 1.00 | 83-9262-0557 | 6.0 |
| 26 | | | | SCREW-WOOD, RND HD #10 X 7/8 | 83-9262-0558 | 3.0 |
| 27 | 23000A901 | D | MINCOM | KIT-INSTALLATION MTG TRANSPORT | 83-5990-0415 | 1.0 |
| 28 | 23028A116 | A | MINCOM | SHAFT-SPRING, COUNTER BALANCE | 83-3280-0614 | 1.0 |
| 29 | 23028A114 | C | MINCOM | WASHER-SPRING, COUNTER BALANCE | 83-3261-4350 | 2.0 |
| 30 | 23028A115 | A | MINCOM | SPACER-SPRING,COUNTER BALANCE | 83-3350-0541 | 12.0 |
| 32 | #9 | | DUCOMMUN | PLATE-MOUNTING, FLANG,3/4 THD | 83-1320-1705 | 1.0 |
| 33 | MS24665-2/6 | | | PIN-COTTER,.078 DIA X 1 1/2 LG | 83-7280-0617 | 2.0 |
| 34 | MS35494-629 | | | SCREW-WOOD, FLAT HD,16-9,1 1/4 | 83-9260-0056 | 4.0 |
| 36 | MS35207-263 | | MIL STD | SCREW-MACH,PAN HD,10-32 X 1/2 | 83-9260-4572 | 2.0 |
| 37 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 2.0 |
| 39 | H31U58 | | HUNTER SPR | SPRING-EXTENSION,.031 THKX 2WD | 83-1280-0616 | 1.0 |
| 40 | 23028A112 | | MINCOM | ARM-SUPPORT,COUNTER BALANCE | 83-3210-0287 | 1.0 |
| 41 | MS35338-43 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#10 | 83-9261-4307 | 2.0 |
| 42 | AN960-516L | | AN STD | WASHER-FLAT,LIGHT SERIES,#5/16 | 83-9261-4014 | 1.0 |
| 43 | MS35650-102 | | MIL STD | NUT-HEX,PLAIN,10-32 X .375 WD | 83-9260-2107 | 2.0 |
| 44 | MS24665-208 | | MIL STD | PIN-COTTER,.078 DIA X .500 LG | 83-7280-0322 | 1.0 |

PARTS LIST    PL 23028A050    REV B

TITLE CABLE ASSY-PWR,4TRK,36 IN    CATALOG NO. 83-4570-0346

---------------- MATERIAL REQUIREMENTS ----------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 51.0 |
| 2 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| 3 | 1-480324-0 | AMP INC | SHELL-CONN,RECT, 15POSITION | 83-1610-0933 | 4.0 |
| 4 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 5 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 6 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 12 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 13 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 14 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 8.0 |
| 15 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 8.0 |
| 16 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |

P A R T S   L I S T                PL 23028A055        REV B

TITLE  CABLE ASSY-PWR,4 TRK,66 IN          CATALOG NO. 83-4570-0380

M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 51.0 |
| 2 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| 3 | 1-480324-0 | AMP INC | SHELL-CONN,RECT, 15POSITION | 83-1610-0933 | 4.0 |
| 4 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 5 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 6 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 12 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 13 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 14 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 8.0 |
| 15 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 8.0 |
| 16 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |

PARTS LIST PL 23028A060 REV C

TITLE CABLE ASSY-PWR,8 TRK,36 IN CATALOG NO. 83-4570-0347

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 91.0 |
| 2 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| 3 | 1-480324-0 | AMP INC | SHELL-CONN,RECT, 15POSITION | 83-1610-0933 | 8.0 |
| 4 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 5 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 6 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 12 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 13 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 14 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 16.0 |
| 15 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 16.0 |
| 16 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |
| 17 | TYPE YQE-91 | BURNDY | SPLICE-ELECTRICAL CONDUCTOR | 83-9630-0470 | 1.0 |

PARTS LIST PL 23028A065 REV B

TITLE CABLE ASSY-PWR,8 TRK,66 CATALOG NO. 83-4570-0381

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 91.0 |
| 2 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| 3 | 1-480324-0 | AMP INC | SHELL-CONN,RECT, 15POSITION | 83-1610-0933 | 8.0 |
| 4 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 5 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 6 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 12 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 13 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |
| 14 | GSB134C | THUM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 16.0 |
| 15 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 16.0 |
| 16 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |

PARTS LIST  PL 23028A070  REV D

TITLE DISPLAY ASSY-METER, 4 BAY  CATALOG NO. 83-5920-1126

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23028A039 | | MINCOM | HOUSING DISPLAY,METER,MOD 23 | 83-3310-0993 | 1.0 |
| 2 | 23028A085 | A | MINCOM | COVER ASSY-DISPLAY PANEL | 83-3310-1157 | 4.0 |
| 3 | 23028A021-3 | | MINCOM | SUPPORT-ANGULAR, CABINET | 83-3340-0522 | 1.0 |
| 4 | 23028A021-4 | | MINCOM | SUPPORT-ANGULAR, CABINET | 83-3340-0523 | 1.0 |
| 5 | 23028A038 | A | MINCOM | PANEL-FILLER, SUPPORT,HOUSING | 83-3360-0933 | 1.0 |
| 6 | 23028A040 | | MINCOM | PANEL-HSG,DISPLAY, METER | 83-3360-0934 | 1.0 |
| 7 | MS35649-62 | | MIL STD | NUT-HEX,PLAIN,6-32 X .313 WD | 83-9260-2005 | 20.0 |
| 8 | MS35649-82 | | MIL STD | NUT-HEX,PLAIN,8-32 X .344 WD | 83-9260-2006 | 8.0 |
| 9 | MS35206-229 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 2.0 |
| 10 | | | | SCR-MACH,F HD,8-32 X 1/2 | 83-9260-6532 | 4.0 |
| 11 | MS24693-S28 | | MIL STD | SCREW-MACH,FH,6-32 X .500 | 83-9260-6579 | 2.0 |
| 12 | MS35338-42 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 8.0 |
| 13 | AN960-6L | | A & N STD | WASHER-FLAT,LIGHT SERIES,#6 | 83-9261-4041 | 23.0 |
| 14 | AN960-8L | | A&N STD | WASHER-FLAT,LIGHT SERIES,#8 | 83-9261-4042 | 8.0 |
| 15 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 4.0 |
| 16 | 23028A075 | C | MINCOM | HARNESS ASSY-METER, REMOTE | 83-4570-0387 | 1.0 |
| 17 | | | | SCREW-WOOD, RD HD,#6 X 7/8 | 83-9262-0555 | 3.0 |
| 18 | | | | SCREW-WOOD, RD HD,#10 X 1.00LG | 83-9262-0559 | 10.0 |
| 19 | | | | WASHER-FLAT,GENERAL PURPSE,#10 | 83-9261-4006 | 10.0 |
| 20 | AN505-8R9 | | A & N STD | SCREW-MACH,FH,8-32 X 9/16 | 83-9260-6533 | 4.0 |

PARTS LIST    PL 23028A075    REV C

TITLE HARNESS ASSY-METER, REMOTE    CATALOG NO. 83-4570-0387

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| P1,P2,P3,P4 | 1-480276-0 | AMP INC | SHELL-CONN,RECT, .665 WD X.850 | 83-1610-0929 | 4.0 |
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 16.0 |
| 2 | RA863 | THOM & BETTS | LUG-TERMINAL SOLDERLS,RING,#8 | 83-9630-0204 | 8.0 |
| 3 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 4 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 5 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 6 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 7 | | | WIRE-TYPE B,22 GA,VIOLET-WHITE | 83-7910-0068 | AR |
| 8 | | AUTOLITE | WIRE-TYPE B,22GA GR/WT NYL JKT | 83-7910-0170 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 12 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |
| 13 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 14 | | | WIRE-TYPE B,22 GA YELLOW NYLN | 83-7910-0259 | AR |
| 15 | | | WIRE TYPE B,22 GA GRAY NYLN | 83-7910-0261 | AR |
| 16 | | | WIRE-TYPE B,22 GA RED NYLN JKT | 83-7910-0264 | AR |
| 17 | | | WIRE-TYPE B,22 GA BLU NYLN JKT | 83-7910-0288 | AR |
| 18 | | | WIRE-TYPE B,22GA BRN NYLN JKT | 83-7910-0301 | AR |
| 19 | | | WIRE-TYPE B,22 GA ORN NYLN JKT | 83-7910-0303 | AR |

P A R T S   L I S T          PL 23028A080          REV C

TITLE  HOUSING ASSY-SIGNAL ELEC 4TRK          CATALOG NO. 83-4310-1000

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23028A036-1 | A MINCOM | FILLER-ANGULAR, REAR, LH, CAB | 83-3290-0160 | 1.0 |
| 2 | 23028A036-2 | A MINCOM | FILLER-ANGULAR, REAR, RH, CAB | 83-3290-0161 | 1.0 |
| 3 | 23028A025-1 | A MINCOM | HOUSING-UPPER, ELEC 4-BAY | 83-3310-0991 | 1.0 |
| 4 | 23028A041 | B MINCOM | HOUSING-LOWER, ELECTRONICS | 83-3310-0994 | 1.0 |
| 5 | 23028A024-1 | B MINCOM | BRKT-MTG, HOUSING, LH, ELEC | 83-3320-1416 | 1.0 |
| 6 | 23028A024-2 | B MINCOM | BRKT-MTG, HOUSING, RH, ELEC | 83-3320-1417 | 1.0 |
| 7 | 23028A021-1 | A MINCOM | SUPPORT-ANGULAR,CAB,CONSOLE LH | 83-3340-0504 | 1.0 |
| 8 | 23028A021-2 | A MINCOM | SUPPORT-ANGULAR,CAB,CONSOLE,RH | 83-3340-0505 | 1.0 |
| 9 | 23028A038 | A MINCOM | PANEL-FILLER, SUPPORT,HOUSING | 83-3360-0933 | 1.0 |
| 10 | MS35649-62 | MIL STD | NUT-HEX,PLAIN,6-32 X .313 WD | 83-9260-2005 | 14.0 |
| 11 | MS35649-82 | MIL STD | NUT-HEX,PLAIN,8-32 X .344 WD | 83-9260-2006 | 8.0 |
| 12 | MS35206-229 | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 2.0 |
| 13 | | | SCR-MACH,F HD,8-32 X 1/2 | 83-9260-6532 | 4.0 |
| 14 | MS24693-S28 | MIL STD | SCREW-MACH,FH,6-32 X .500 | 83-9260-6579 | 12.0 |
| 15 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 8.0 |
| 16 | AN960-6L | A & N STD | WASHER-FLAT,LIGHT SERIES,#6 | 83-9261-4041 | 14.0 |
| 17 | AN960-8L | A&N STD | WASHER-FLAT,LIGHT SERIES,#8 | 83-9261-4042 | 8.0 |
| 18 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 14.0 |
| 19 | A6732-5-02 | ESNA | NUT-NON LKG,PL,10-32 | 83-9260-0059 | 16.0 |
| 20 | | | SCREW-WOOD, RD HD,#10 X 1.00LG | 83-9262-0559 | 10.0 |
| 21 | | | SCREW-WOOD, RD HD,#6 X 7/8 | 83-9262-0555 | 3.0 |
| 22 | AN505-8R9 | A & N STD | SCREW-MACH,FH,8-32 X 9/16 | 83-9260-6533 | 4.0 |

M23 RRM 2-69

TITLE COVER ASSY-DISPLAY PANEL          CATALOG NO. 83-3310-1157

## M A T E R I A L   R E Q U I R E M E N T S

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23028A045 | MINCOM | PLATE-COVER,DISPLAY PANEL | 83-3320-1444 | 1.0 |
| 2 | 04032.002-1 | E MINCOM | HANDLE-PULL,1.517 LONG | 83-3270-0144 | 1.0 |
| 3 | MS35206-213 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 4 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 2.0 |
| 5 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |

P A R T S  L I S T  PL 23028A090  REV C

TITLE HOUSING ASSY-SIGNAL ELEC, 2TRK  CATALOG NO. 83-4310-0999

- - - - - - - - - - - - - - - - - - M A T E R I A L  R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23028A036-3 | A MINCOM | FILLER-ANGULAR, REAR, LH CAB | 83-3290-0162 | 1.0 |
| 2 | 23028A036-4 | A MINCOM | FILLER-ANGULAR, REAR, RH, CAB | 83-3290-0163 | 1.0 |
| 3 | 23028A025-2 | A MINCOM | HOUSING-UPPER, ELECTRONICS | 83-3310-0992 | 1.0 |
| 4 | 23028A041 | B MINCOM | HOUSING-LOWER, ELECTRONICS | 83-3310-0994 | 1.0 |
| 5 | 23028A024-3 | B MINCOM | BRKT-MTG, HOUSING, LH ELEC | 83-3320-1418 | 1.0 |
| 6 | 23028A024-4 | B MINCOM | BRKT-MTG, HOUSING, RH ELEC | 83-3320-1419 | 1.0 |
| 7 | 23028A021-1 | A MINCOM | SUPPORT-ANGULAR,CAB,CONSOLE LH | 83-3340-0504 | 1.0 |
| 8 | 23028A021-2 | A MINCOM | SUPPORT-ANGULAR,CAB,CONSOLE,RH | 83-3340-0505 | 1.0 |
| 9 | 23028A038 | A MINCOM | PANEL-FILLER, SUPPORT,HOUSING | 83-3360-0933 | 1.0 |
| 10 | MS35649-62 | MIL STD | NUT-HEX,PLAIN,6-32 X .313 WD | 83-9260-2005 | 14.0 |
| 11 | MS35649-82 | MIL STD | NUT-HEX,PLAIN,8-32 X .344 WD | 83-9260-2006 | 8.0 |
| 12 | MS35206-229 | MIL STD | SCREW-MACH,PAN HD,6-32 X 7/16 | 83-9260-4532 | 2.0 |
| 13 | | | SCR-MACH,F HD,8-32 X 1/2 | 83-9260-6532 | 4.0 |
| 14 | MS24693-S28 | MIL STD | SCREW-MACH,FH,6-32 X .500 | 83-9260-6579 | 12.0 |
| 15 | MS35338-42 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#8 | 83-9261-4020 | 8.0 |
| 16 | AN960-6L | A & N STD | WASHER-FLAT,LIGHT SERIES,#6 | 83-9261-4041 | 14.0 |
| 17 | AN960-8L | A&N STD | WASHER-FLAT,LIGHT SERIES,#8 | 83-9261-4042 | 8.0 |
| 18 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 14.0 |
| 19 | A6732-5-02 | ESNA | NUT-NON LKG,PL,10-32 | 83-9260-0059 | 8.0 |
| 20 | | | SCREW-WOOD, RD HD,#10 X 1.00LG | 83-9262-0559 | 10.0 |
| 21 | | | SCREW-WOOD, RD HD,#6 X 7/8 | 83-9262-0555 | 3.0 |
| 22 | AN505-8R9 | A & N STD | SCREW-MACH,FH,8-32 X 9/16 | 83-9260-6533 | 4.0 |

PARTS LIST PL 23028A250 REV A

TITLE CABLE ASSY-POWER,REPRODUCER CATALOG NO. 83-4570-0420

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| J10 | 1-480273-0 | AMP INC | SHELL-CONN,RECT,.565 WDX.65 | 83-1610-0923 | 1.0 |
| P1 | 78S8 | AMPHENOL | SOCKET-TUBE, 8 CONTACT | 83-1620-0188 | 1.0 |
| P4 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| 1 | 60510-4 | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 4.0 |
| 2 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 5.0 |
| 3 | 3-24 | AMPHENOL | CLAMP-CABLE,SOCKET MTG,.375MCE | 83-1650-0483 | 1.0 |
| 4 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 5 | | | WIRE-TYPE B 16GA RED NYLON JAC | 83-7910-0050 | AR |
| 6 | | NATL WIRE CO | WIRE-PVC,TYPE B,16 GA,GRAY/BLK | 83-7910-0047 | AR |
| 7 | NATL WIRE&CABLE | | WIRE-PVC TYPE B NYLON 20GA BRN | 83-7910-0037 | AR |
| 8 | | SURPRENANT | WIRE-TYPE B,20 GA RED-WHITE | 83-7910-0053 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |

P A R T S   L I S T          PL 23028A350          REV A

TITLE  CABLE ASSY-PWR, FILM SYNC          CATALOG NO. 83-4570-0466

- - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| P4 | 1-480278-0 | AMP INC | SHELL-CONN,RECT,12 POSITIONS | 83-1610-0931 | 1.0 |
| P110 | 1-480324-0 | AMP INC | SHELL-CONN,RECT, 15POSITION | 83-1610-0933 | 1.0 |
| 1 | 60511-4-LP | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 20.0 |
| 2 | GSB134C | THOM & BETTS | FERRULE-RF CABLE GND .134ID | 83-9690-0020 | 2.0 |
| 3 | GSC194C | THOMAS&BETTS | FERRULE-RF CABLE GROUNDING | 83-9690-0118 | 2.0 |
| 4 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 5 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 6 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 7 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 8 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 9 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 10 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 11 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 12 | 3025-070-5/16ID | 3M | TUBING-SCOTCHTITE,CLEAR VINYL | 83-7910-0279 | AR |
| 13 | NB1934N2SJ | NATL WIRE | WIRE-TYPE B,22GA RED/BLU 2 CON | 83-7910-0362 | AR |

PARTS LIST     PL 23059A010     REV H

TITLE HOUSING ASSY-AUDIO,SIG ELECT     CATALOG NO. 83-5920-0842

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C101 | MIL CS13AC221 | MIL STD | CAP-FXD,TA, 47UF 35V 20% | 83-1510-6085 | 1.0 |
| CR101,CR102,CR104 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 3.0 |
| DS103 | RDL-A1F1-0000 | TSTR ELECT | LIGHT-INDICATOR,P2STC,RED | 83-1550-2582 | 1.0 |
| J101 | D3F | SWITCHCRAFT | CONN-RECP,ELEC,PNL MTG, 3 SOC | 83-1610-1105 | 1.0 |
| J102 | D3M | SWITCHCRAFT | CONN-RECP,ELEC,PNL MTG, 3 PIN | 83-1610-1106 | 1.0 |
| J103 | N-111 | SWITCHCRAFT | JACK-TEL,2 CONDUCTOR,INSULATED | 83-1610-0885 | 1.0 |
| J104,J105,J106,J107,J108 | MS3102E10SL-3P | MIL STD | CONN-RECPT,BOX MTG,3 PIN CONT | 83-1610-1510 | 5.0 |
| J109,J111 | 1-480273-0 | AMP INC | SHELL-CONN,RECT,.565 WDX.65 | 83-1610-0923 | 2.0 |
| J110 | 1-480323-0 | AMP INC | SHELL-CONN,RECT, .650WDX1.280 | 83-1610-0934 | 1.0 |
| K101,K102 | KHP17D11 | POTTR & BRUM | RELAY-4PDT,650 OHM 24VDC 3 AMP | 83-1550-3550 | 2.0 |
| Q101 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 1.0 |
| R100 | 302163 | CTS OF BERNE | RES-VAR, WW, 2K OHM 5W 5% | 83-1520-1299 | 1.0 |
| R101 | 0A781-7356 | MINCOM SPEC | RES-FXD,FILM,620 OHM,1/2W,2% S | 83-1520-7356 | 1.0 |
| R102,R118 | 0A781-7202 | MINCOM SPEC | RES-FXD,FILM,150 OHM,1/2W,2% S | 83-1520-7202 | 2.0 |
| R104,R105 | 0A781-7365 | MINCOM SPEC | RES-FXD,FILM,5.6K OHM,1/2W,2%S | 83-1520-7365 | 2.0 |
| R106 | 301073 | CTS OF BERNE | RES-VAR, WW, 10K OHM 5W 5% | 83-1520-1336 | 1.0 |
| R108 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R110 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,33 OHM,1 W, 5% | 83-9520-4120 | 1.0 |
| R114 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,270 OHM 1W 5% | 83-9520-4091 | 1.0 |
| R115,R117 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,390 OHM 1W 5% | 83-9520-4142 | 2.0 |
| R116 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| R119 | 0A781-7359 | MINCOM SPEC | RES-FXD,FILM,1.2K OHM,1/2W,2%S | 83-1520-7359 | 1.0 |
| R120 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| S101 | SEE DESC | DIALCO | SWITCH-PB, 922-1141-1572-523 | 83-1550-5227 | 1.0 |
| S102 | SEE DESC | DIALCO | SWITCH-PB, 922-1141-1573-523 | 83-1550-5226 | 1.0 |
| S103,S104 | PA-022-1449 | CENTRALAB | SWITCH-ROT,PHEN,115VAC 230 MA | 83-1550-5225 | 2.0 |
| S105 | SS43 | STACKPOLE | SWITCH-SLIDE,SP 3 POSITION | 83-1550-5228 | 1.0 |
| S106 | SS50 | STACKPOLE | SWITCH-SLIDE,DPDT | 83-1550-5229 | 1.0 |
| T101 | 23059A025 B | MINCOM | XMFR-AUDIO INPUT,SIGNAL ELECT | 83-3540-1122 | 1.0 |
| T102 | 23059A029 A | MINCOM | XMFR-AUDIO OUTPUT,SIGNAL ELECT | 83-3540-1109 | 1.0 |
| TB1,TB2 | 4-01769 | ALCON | TERM BD-5 POS,.325 WD X1.312LG | 83-1640-0625 | 2.0 |
| 1 | 23059A001-1 B | MINCOM | PLATE-HSG MTG,RH,SIG ELECT | 83-3320-1128 | 1.0 |
| 2 | 23059A001-2 B | MINCOM | PLATE-MTG,HSNG,RH,SIGNAL ELECT | 83-3320-1129 | 1.0 |
| 3 | 23059A006-1 D | MINCOM | PLATE-PANEL MTG,LH,SIG ELECT | 83-3320-1130 | 2.0 |

P A R T S   L I S T          PL 23059A010          REV H

TITLE  HOUSING ASSY-AUDIO,SIG ELECT          CATALOG NO. 83-5920-0842

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 5 | 23059A004 | B MINCOM | SUPPORT-ROD,GUIDE,P.C. BOARD | 83-3340-0389 | 4.0 |
| 6 | 23059A024 | E MINCOM | BRACKET-XMFR MTG,SIGNAL ELECT | 83-3320-1133 | 2.0 |
| 7 | 23059A026 | B MINCOM | BRACKET-SLOTTED,DOOR STOP | 83-3320-1127 | 1.0 |
| 8 | 23059A003 | D MINCOM | PANEL-FRONT,SIGNAL ELECTRONICS | 83-3360-0731 | 1.0 |
| 9 | 23059A014-3 | B MINCOM | HINGE-BUTT,CHASSIS HALF | 83-3270-0479 | 1.0 |
| 10 | 23059A027 | B MINCOM | ROD-DOOR STOP,SIGNAL ELECT | 83-3280-0418 | 1.0 |
| 11 | 23059A013-1 | B MINCOM | HINGE-BUTT,DOOR LEAF,LH | 83-3270-0475 | 1.0 |
| 12 | 23059A013-2 | B MINCOM | HINGE-BUTT,DOOR LEAF,RH | 83-3270-0476 | 1.0 |
| 13 | R102-125 | SCANBE | SPACER-GUIDE,P.C. BD,.125 THK | 83-1350-0385 | 8.0 |
| 14 | 00000A614-7 | G MINCOM | SPACER-P.C. BD,CHAN, .500 LG | 83-3350-0236 | 16.0 |
| 15 | 00000A614-9 | G MINCOM | SPACER-P.C. BD,CHAN,.625 LG | 83-3350-0238 | 16.0 |
| 16 | 00000A614-21 | G MINCOM | SPACER-P.C. BD,CHAN,2.941 LG | 83-3350-0386 | 4.0 |
| 17 | 00000A614-22 | G MINCOM | SPACER-P.C. BD,CHAN,3.190 LG | 83-3350-0387 | 8.0 |
| 18 | 23059A002 | D MINCOM | PANEL-CONNECTOR MTG,SIG ELECT | 83-3360-0730 | 1.0 |
| 19 | 23059A007 | B MINCOM | PANEL-FRONT,COMPONENT MTG | 83-3360-0729 | 1.0 |
| 20 | 091-0024-000 | VIKING | INSERT-POLARIZING,CONN,.300 LG | 83-1610-0760 | 8.0 |
| 23 | 23059A028 | B MINCOM | SPRING-DOOR CATCH,SIG ELECT | 83-3280-0447 | 1.0 |
| 31 | KL701 | RAYTHEON | LOCK-DIAL,KNOB,RD,1.00 DIA | 83-1270-0388 | 2.0 |
| 32 | DS70-1-2 | RAYTHEON | KNOB-CONTROL,RD,UNSKIRTED | 83-1270-0486 | 2.0 |
| 33 | DS70-3-2 | RAYTHEON | KNOB-CONTROL,RD,SKIRTED | 83-1270-0487 | 2.0 |
| 34 | 327 | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 3.0 |
| 35 | R-301-51A | SCANBE | GUIDE-P.C. BD,5.287 LG | 83-1340-0393 | 20.0 |
| 37 | 9KH1 | POT.BRUM | SOCKET-RELAY,14CONT | 83-1620-0108 | 2.0 |
| 38 | 2VK22S/1-2 | VIKING | CONN-P.C.,ELEC,PIERCD, 22 CON | 83-1610-0845 | 8.0 |
| 44 | 60510-4 | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 27.0 |
| 48 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 38.0 |
| 49 | MS35206-227 | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 2.0 |
| 50 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 14.0 |
| 51 | MS35190-223 | MIL STD | SCREW-MACH,FH,4-40 X 3/8 | 83-9260-6504 | 4.0 |
| 52 | | | SCR-MACH,F HD,8-32 X .500 LG | 83-9260-6610 | 8.0 |
| 53 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 24.0 |
| 54 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 20.0 |
| 55 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 42.0 |
| 56 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 30.0 |
| 57 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 42.0 |
| 58 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 30.0 |
| 59 | SE-45 BRASS | UNITED SHOE | EYELET-MET, .121 OD X.169LG | 83-7290-0097 | 4.0 |
| 60 | 23059A051 | B MINCOM | LENS-MOLDED,PWR SUP,WITH METER | 83-3550-1419 | 1.0 |
| 62 | 23059A012-1 | B MINCOM | LABEL-I.D,NAB & DYNATRACK, LH | 83-3550-1573 | 1.0 |
| 63 | 23059A012-2 | B MINCOM | LABEL-I.D,NAB & DYNATRACK, RH | 83-3550-1574 | 1.0 |
| 64 | 00000A769 | C MINCOM | LABEL-IDENTIFICATION,MODULE | 83-3550-1621 | 1.0 |
| 65 | YEC 120 | BURNDY | FERRULE-RF CABLE GND,.300 OD | 83-9690-0240 | 18.0 |

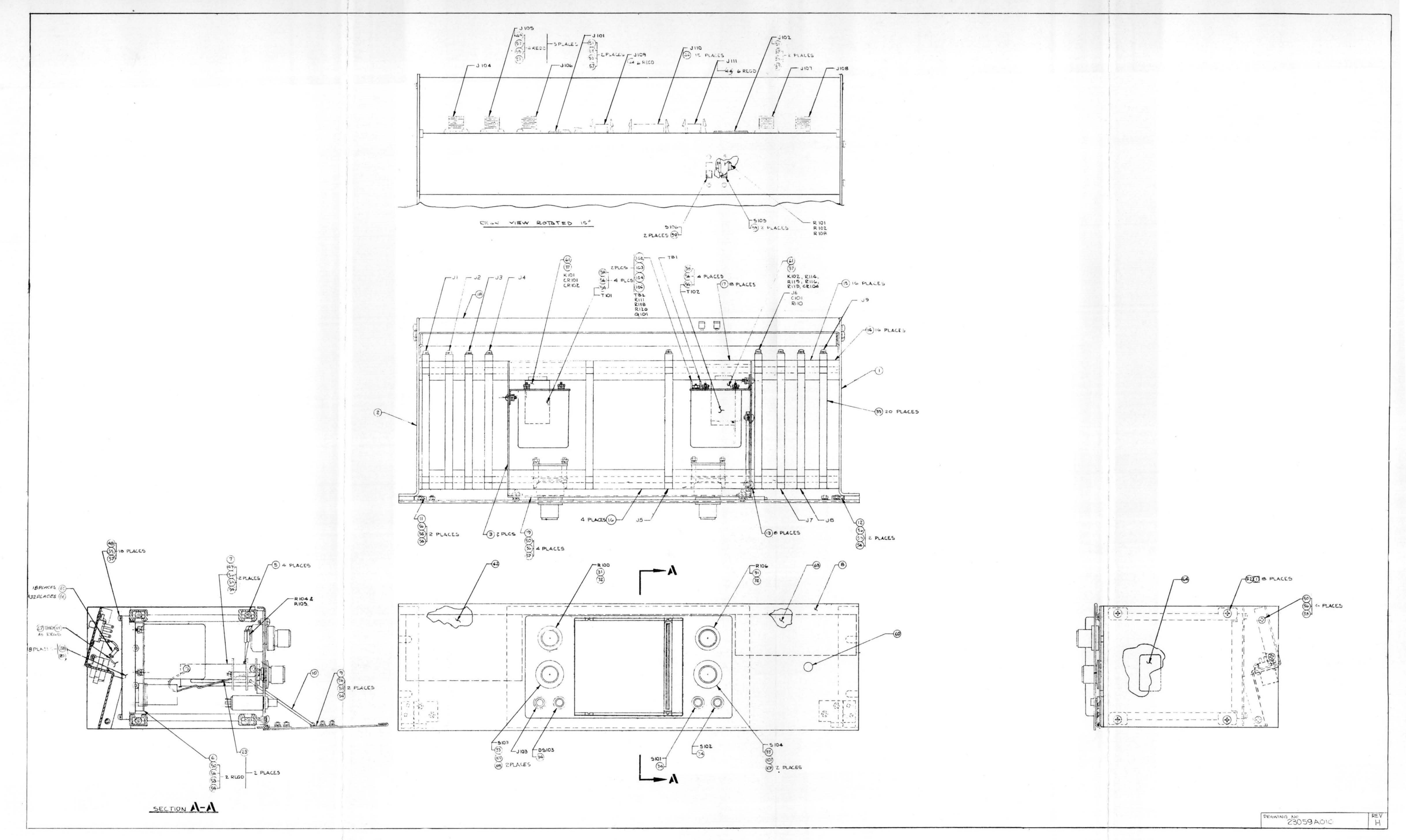



Figure 49. Audio Signal Electronics Housing Assembly

P A R T S   L I S T     PL 23059A010     REV H

TITLE  HOUSING ASSY-AUDIO,SIG ELECT     CATALOG NO. 83-5920-0842

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 66 | YEC-100 | BRUNDY | FERRULE-RF CABLE YEL,.270 OD | 83-9690-0212 | 32.0 |
| 67 | | NATIONAL | WIRE,PVC,SHIELDED 24GA 2COND | 83-7910-0511 | AR |
| 68 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0052 | AR |
| 69 | 1561-2 | | WIRE-TYPE MW,22GA BLK NYLN JKT | 83-7910-0460 | AR |
| 70 | 1561-3 | | WIRE-TYPE MW,22GA RED NYLN JKT | 83-7910-0461 | AR |
| 71 | 1561-8 | ALPHA WIRE | WIRE-TYPE MW,22GA ORNG NYL JKT | 83-7910-0462 | AR |
| 72 | 1561-5 | | WIRE-TYPE MW,22GA YEL NYLN JKT | 83-7910-0463 | AR |
| 73 | 1561-6 | ALPHA WIRE | WIRE-TYPE MW,22GA BLU NYLN JKT | 83-7910-0464 | AR |
| 74 | 1561-1 | ALPHA WIRE | WIRE-TYPE MW,22GA WHT NYLN JKT | 83-7910-0467 | AR |
| 75 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 76 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 77 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 78 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0043 | AR |
| 79 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |
| 80 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 81 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 82 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 83 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |
| 84 | | SURPRENANT | WIRE-PVC TYPE B, 22 GA,RED-BLK | 83-7910-0066 | AR |
| 85 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,YEL-BLK | 83-7910-0067 | AR |
| 86 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,GRN-BLK | 83-7910-0069 | AR |
| 87 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,BLU-BLK | 83-7910-0070 | AR |
| 88 | | NATL WIRE | WIRE-TYPE B,22GA WHT/BLK NYLN | 83-7910-0262 | AR |
| 89 | | NATL WIRE | WIRE-TYPE B,22GA ORN/BLK NYLN | 83-7910-0297 | AR |
| 90 | | NATL WIRE | WIRE-TYPE B,22GA GRY/BLK NYLN | 83-7910-0298 | AR |
| 91 | | NATL WIRE | WIRE-TYPE B,22GA PR/BLK NYLN | 83-7910-0299 | AR |
| 92 | | NATL WIRE | WIRE-PVC,B NYLON,22GA,BRN-BLK | 83-7910-0300 | AR |
| 93 | | | WIRE-TYPE B,22 GA,VIOLET-WHITE | 83-7910-0068 | AR |
| 94 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,BLK-WHT | 83-7910-0071 | AR |
| 95 | | | WIRE-TYPE B,22 GA YELLOW NYLN | 83-7910-0259 | AR |
| 96 | | NATL WIRE | WIRE-PVC TYPE B, 22 GA,GRN-WHT | 83-7910-0260 | AR |
| 97 | | | WIRE TYPE B,22 GA GRAY NYLN | 83-7910-0261 | AR |
| 98 | | | WIRE-TYPE B,22 GA RED NYLN JKT | 83-7910-0264 | AR |
| 99 | | | WIRE-TYPE B,22 GA BLU NYLN JKT | 83-7910-0288 | AR |
| 100 | | | WIRE-TYPE B,22GA BRN NYLN JKT | 83-7910-0301 | AR |
| 101 | | | WIRE-TYPE B,22 GA ORN NYLN JKT | 83-7910-0303 | AR |
| 102 | MS35206-205 | MIL STD | SCREW-MACH, PAN HD,2-56 X 3/8 | 83-9260-4504 | 2.0 |
| 103 | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 2.0 |
| 104 | MS35338-39 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 2.0 |
| 105 | | | NUT-HEX,SM PATT,2-56 X .156 WD | 83-9260-2206 | 2.0 |
| 106 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 2.0 |
| 107 | MS35333-42 | MIL STD | WASHER-LOCK,FLAT,INT T,#3/8 | 83-9261-4211 | 2.0 |

P A R T S   L I S T          PL 23059A010          REV H

TITLE  HOUSING ASSY-AUDIO,SIG ELECT          CATALOG NO. 83-5920-0842

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 108 | M-2786 | ALLEN BRADLY | NUT-HEX,PLAIN,3/8-32 X .500 OD | 83-9260-2112 | 4.0 |

P A R T S   L I S T          PL 23059A020          REV F

TITLE  P.C. BD ASSY-BIAS,ERASE          CATALOG NO. 83-4930-1121

- - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1 | D1P5D | HOPKINS | CAP-FXD,PAPER, .10UF, 50V,20% | 83-1510-4185 | 1.0 |
| C2 | 107X002 | SPRAGUE | CAP-FXD,TA, 100 UF, 25V, 20% | 83-1510-6222 | 1.0 |
| C3,C20 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| C4,C5 | 210B1B103J | ELECTRO CUBE | CAP-FXD,PLSTC, .01UF,100V, 5% | 83-1510-4192 | 2.0 |
| C6,C7,C8,C9 | TSD-1-20-225 | COMP INC | CAP-FXD,TA, 2.2UF 20V 20% | 83-1510-6240 | 4.0 |
| C10,C13,C16 | 192P10392 | SPRAGUE | CAP-FXD,PAPER, .01 UF,200V,10% | 83-1510-4414 | 3.0 |
| C12,C15 | TSD3-15-226 | COMP INC | CAP-FXD,TA, 22UF 15V 20% | 83-1510-6257 | 2.0 |
| C14,C17 | 192P33292 | SPRAGUE | CAP-FXD,PAPER,.0033UF,200V,10% | 83-1510-4405 | 2.0 |
| C18 | WMF1S47 | CORNL-DUBLR | CAP-FXD,PLSTC,.047UF 100V 10% | 83-1510-4481 | 1.0 |
| C19 | 831-X3R-271K | ERIE | CAP-FXD,CER, 270PF1000V 10% | 83-1510-1103 | 1.0 |
| C21 | 4610 | ARCO | CAP-VAR,MICA,190-900 PF | 83-1510-6252 | 1.0 |
| CR1,CR2,CR3 | 1N270 | HUGHES | DIODE-GE,GEN PUR,100PIV, 60 MA | 83-1530-0263 | 3.0 |
| L1 | 4631 | J.W. MILLER | INDUCTOR-FXD,82UH,250MA | 83-1540-0409 | 1.0 |
| L2 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 1.0 |
| Q1,Q2,Q5,Q6 | 2N3053 | R.C.A. | TSTR-SI,NPN, PWR, 60 VCB | 83-1530-2180 | 4.0 |
| Q3,Q4 | 2N3054 | R.C.A. | TSTR-SI,NPN, H PWR, 100 HFE | 83-1530-2227 | 2.0 |
| R1,R14,R17 | 0A781-7221 | MINCOM SPEC | RES-FXD,FILM,100 OHM,1/2W,2% S | 83-1520-7221 | 3.0 |
| R2 | 0A781-7358 | MINCOM SPEC | RES-FXD,FILM,820 OHM,1/2W,2% S | 83-1520-7358 | 1.0 |
| R3,R4 | 0A781-7175 | MINCOM SPEC | RES-FXD,FILM,1K OHM,1/2W,2% S | 83-1520-7175 | 2.0 |
| R5,R27 | 0A781-7144 | MINCOM SPEC | RES-FXD,FILM,15K OHM,1/2W,2% S | 83-1520-7144 | 2.0 |
| R6,R8 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 2.0 |
| R7,R28 | 0A781-7145 | MINCOM SPEC | RES-FXD,FILM,12K OHM,1/2W,2% S | 83-1520-7145 | 2.0 |
| R9,R10 | 0A781-7355 | MINCOM SPEC | RES-FXD,FILM,560 OHM,1/2W,2% S | 83-1520-7355 | 2.0 |
| R11,R12 | 0A781-7337 | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 2.0 |
| R13 | 0A781-7363 | MINCOM SPEC | RES-FXD,FILM,3.9K OHM,1/2W,2%S | 83-1520-7363 | 1.0 |
| R15,R18 | 0A781-7329 | MINCOM SPEC | RES-FXD,FILM,22 OHM,1/2W,2% S | 83-1520-7329 | 2.0 |
| R16 | 0A781-7146 | MINCOM SPEC | RES-FXD,FILM,18K OHM,1/2W,2% S | 83-1520-7146 | 1.0 |
| R19,R22 | 0A781-7331 | MINCOM SPEC | RES-FXD,FILM,27 OHM,1/2W,2% S | 83-1520-7331 | 2.0 |
| R20,R21 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 2.0 |

PARTS LIST PL 23059A020 REV F

TITLE P.C. BD ASSY-BIAS,ERASE CATALOG NO. 83-4930-1121

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| R23,R24 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 2.0 |
| R25 | 77PR1K | BECKMAN | RES-VAR,COMP,1K OHM,3/4 W, 10% | 83-1520-1211 | 1.0 |
| R26 | 0A781-7379 | MINCOM SPEC | RES-FXD,FILM,47K OHM,1/2W,2% S | 83-1520-7379 | 1.0 |
| R29 | 0A781-7325 | MINCOM SPEC | RES-FXD,FILM,10 OHM,1/2W,2% S | 83-1520-7325 | 1.0 |
| T1 | 00000A718 | A MINCOM | XMFR-TORROIDAL,ARNOLD CORE | 83-3540-1150 | 1.0 |
| T2,T4,T5 | 00000A719 | A MINCOM | XMFR-TORROIDAL,ARNOLD CORE | 83-3540-1151 | 3.0 |
| T3 | 00000A720 | A MINCOM | XMFR-TORR/IDAL,ARNOLD CORE | 83-3540-1152 | 1.0 |
| TP1 | 3-582118-9 | AMP INC | JACK-TIP,.156 WD X .460 DP | 83-1610-0752 | 1.0 |
| 1 | 23059A021 | E MINCOM | P.C. BD-BIAS,ERASE | 83-3640-0666 | 1.0 |
| 2 | 00000A667 | B MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 4 | 00000A734-1 | B MINCOM | LABEL-IDENT,P.C. BD,MARKED *1* | 83-3550-1446 | 1.0 |
| 5 | 23059A016 | A MINCOM | BRACKET-COMPONENT MTG,SIG ELEC | 83-3320-1132 | 1.0 |
| 7 | TXBF-032-025B | IERC | HEAT SINK-ELEC COMP,TO-5 CASE | 83-9690-0108 | 2.0 |
| 8 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 4.0 |
| 9 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 4.0 |
| 10 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 4.0 |
| 11 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 4.0 |
| 12 | #EXE-22-122 | THERMAX | WIRE-TYPE C,22GA WHT TEFLN JKT | 83-7910-0476 | AR |
| 13 | | | WASHER-FLAT,SM PATT,#10 | 83-9261-4046 | 1.0 |

P A R T S   L I S T          PL 23059A030          REV D

TITLE  P.C.BD ASSY-NAB ERASE COUPLER          CATALOG NO. 83-4930-1117

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1 | TYPE 311 | ARCO | CAP-VAR,MICA,780-2110PF 250V | 83-1510-6274 | 1.0 |
| R3 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 1.0 |
| TP1 | 3-582118-9 | AMP INC | JACK-TIP,.156 WD X .460 DP | 83-1610-0752 | 1.0 |
| 1 | 23059A031 E | MINCOM | P.C.BD-NAB ERASE COUPLER | 83-3640-0665 | 1.0 |
| 2 | 30113A018-2 A | MINCOM | SHIELD-CIRCUIT BD | 83-3650-0387 | 1.0 |
| 3 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 4 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 5 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |
| 6 | MS35206-202 | MIL STD | SCREW-MACH,PAN HD,2-56 X 3/16 | 83-9260-4501 | 4.0 |
| 7 | | | WASHER-FLAT,GENERAL PURPOSE,#2 | 83-9261-4040 | 4.0 |
| 8 | MS35338-39 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 4.0 |
| 9 | 00000A734-2 B | MINCOM | LABEL-IDENT,P.C. BD,*3N* | 83-3550-1447 | 1.0 |
| 10 | NAS620-416 | NAS STD | WASHER-FLAT,SM PATT,#1/4 | 83-9261-4043 | 2.0 |

P A R T S  L I S T    PL 23059B040    REV F

TITLE P.C. BD ASSY-RECORD,NAB    CATALOG NO. 83-4930-1214

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| R13 | 0A781-7383 | MINCOM SPEC | RES-FXD,FILM,68K OHM,1/2W,2% S | 83-1520-7383 | 1.0 |
| R15 | 0A781-7201 | MINCOM SPEC | RES-FXD,FILM,1.8K OHM,1/2W,2%S | 83-1520-7201 | 1.0 |
| R16,R29 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 2.0 |
| R17 | 0A781-7359 | MINCOM SPEC | RES-FXD,FILM,1.2K OHM,1/2W,2%S | 83-1520-7359 | 1.0 |
| R18 | 0A781-7342 | MINCOM SPEC | RES-FXD,FILM,82 OHM,1/2W,2% S | 83-1520-7342 | 1.0 |
| R19 | 0A781-7337 | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 1.0 |
| R20 | 77PR100 | BECKMAN | RES-VAR,COMP,100 OHM,3/4 W,10% | 83-1520-1153 | 1.0 |
| R21 | 0A781-7333 | MINCOM SPEC | RES-FXD,FILM,33 OHM,1/2W,2% S | 83-1520-7333 | 1.0 |
| R22 | 0A781-7345 | MINCOM SPEC | RES-FXD,FILM,180 OHM,1/2W,2% S | 83-1520-7345 | 1.0 |
| R23 | 0A781-7379 | MINCOM SPEC | RES-FXD,FILM,47K OHM,1/2W,2% S | 83-1520-7379 | 1.0 |
| R26 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R27 | 0A781-7220 | MINCOM SPEC | RES-FXD,FILM,220 OHM,1/2W,2% S | 83-1520-7220 | 1.0 |
| R28 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R30 | 77PR10K | BECKMAN | RES-VAR,COMP,10K OHM,3/4 W,10% | 83-1520-1213 | 1.0 |
| S1 | TYPE G350-PC | CONTL WIRT | SWITCH-SLIDE, DPDT,125V 3AMP | 83-1550-5212 | 1.0 |
| TP1 | 3-582118-9 | AMP INC | JACK-TIP,.156 WD X .460 DP | 83-1610-0752 | 1.0 |
| TP2 | 3-582118-0 | AMP INC | JACK-TEST,.156WD X .230 HT,BLK | 83-1610-0765 | 1.0 |
| 1 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 2 | 23059A016 A | MINCOM | BRACKET-COMPONENT MTG,SIG ELEC | 83-3320-1132 | 2.0 |
| 3 | 00000A734-3 B | MINCOM | LABEL-IDENT,P.C.BD, *4* | 83-3550-1448 | 1.0 |
| 4 | 23059B041 F | MINCOM | P.C. BD-RECORD,NAB | 83-3640-0729 | 1.0 |
| 5 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 6 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 3.0 |
| 7 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 1.0 |
| 8 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |
| 10 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 12 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |

M23 RRM 2-69

PARTS LIST PL 23059B040 REV F

TITLE P.C. BD ASSY-RECORD,NAB CATALOG NO. 83-4930-1214

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1,C10,C14 | TSD3-15-226 | COMP INC | CAP-FXD,TA, 22UF 15V 20% | 83-1510-6257 | 3.0 |
| C2 | 112A1B334J | ELECTRO CUBE | CAP-FXD,PAPER, .33UF 100V 5% | 83-1510-4301 | 1.0 |
| C3 | 112A1B683K | ELECTRO CUBE | CAP-FXD,PAPER,.068 UF,100V,10% | 83-1510-4332 | 1.0 |
| C4 | 112A1A104J | ELECTRO-CUBE | CAP-FXD,PAPER, .10UF 50V 5% | 83-1510-4310 | 1.0 |
| C5 | 17W1-203J | JEDCO | CAP-FXD,PLSTC, .02UF,100V, 5% | 83-1510-4191 | 1.0 |
| C7 | TSD-1-20-225 | COMP INC | CAP-FXD,TA, 2.2UF 20V 20% | 83-1510-6240 | 1.0 |
| C8 | TYPE E3FR | MIDWEC | CAP-FXD,PLSTC,.0033UF 100V 5% | 83-1510-4445 | 1.0 |
| C9 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C11 | TSD5-20-476 | COMP INC | CAP-FXD,TA, 47UF 20V 20% | 83-1510-6199 | 1.0 |
| C12 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C13 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 1.0 |
| C15 | TSD1-20-475 | COMP INC | CAP-FXD,TA, 4.7UF 20V 20% | 83-1510-6196 | 1.0 |
| C17 | 210B1C102K | ELECTRO CUBE | CAP-FXD,PLSTC,.001 UF,200V,10% | 83-1510-4296 | 1.0 |
| C18,C19 | 464 | ARCO | CAP-VAR,MICA,25 MMF-280 MMF | 83-1510-6277 | 2.0 |
| K1 | 701-3 | ELEC-TROL | RELAY-SPDT, 2K OHM 24VDC | 83-1550-3620 | 1.0 |
| Q1,Q3,Q7 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR; 25 VCB | 83-1530-2230 | 3.0 |
| Q2 | 2N3684 | | TSTR-SI,N-CHAN,FLD EFFECT 50MA | 83-1530-2244 | 1.0 |
| Q4 | 2N3405 | G.E. | TSTR-SI,NPN,GEN PUR,50VCE | 83-1530-2232 | 1.0 |
| Q5,Q6 | 2N2614 | | TSTR-GE,PNP, SIGNAL, 40VCB | 83-1530-2233 | 2.0 |
| R1 | 0A781-7397 | MINCOM SPEC | RES-FXD,FILM,390K OHM,1/2W$2%S | 83-1520-7397 | 1.0 |
| R2,R25 | 0A781-7372 | MINCOM SPEC | RES-FXD,FILM,22K OHM,1/2W,2% S | 83-1520-7372 | 2.0 |
| R3 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 1.0 |
| R4 | 0A781-7175 | MINCOM SPEC | RES-FXD,FILM,1K OHM,1/2W,2% S | 83-1520-7175 | 1.0 |
| R5 | 0A781-7174 | MINCOM SPEC | RES-FXD,FILM,390 OHM,1/2W,2% S | 83-1520-7174 | 1.0 |
| R6,R24 | 0A781-7393 | MINCOM | RES-FXD,FILM,270K OHM,1/2W,2%S | 83-1520-7393 | 2.0 |
| R7 | 0A781-7373 | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 1.0 |
| R8 | 0A781-7387 | MINCOM SPEC | RES-FXD,FILM,100K OHM,1/2W,2%S | 83-1520-7387 | 1.0 |
| R9,R14 | 0A781-7369 | MINCOM SPEC | RES-FXD,FILM,8.2K OHM,1/2W,2%S | 83-1520-7369 | 2.0 |
| R10 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| R12 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 1.0 |

PARTS LIST PL 23059A050

TITLE PWR SUP ASSY-SIG ELECT,W/METER CATALOG NO. 83-5920-0822

## MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C1 | HC5020A | | MALLORY | CAP-FXD,ELECT,2000 UF,50 WVDC | 83-1510-2075 | 1.0 |
| M1 | 23059A052 | C | MINCOM | METER-MICROVOLT,ILLUM DIAL | 83-3550-3005 | 1.0 |
| Q1 | 2N3055 | | R.C.A. | TSTR-SI,NPN, PWR, 100 VCB | 83-1530-2157 | 1.0 |
| T1 | 23009A004 | A | MINCOM | XMFR-PWR,48-62 CPS.115V 10% | 83-3540-1141 | 1.0 |
| 1 | CMC-28A | | SPRAGUE | RETAINER-CAP MTG,RING TYPE | 83-1650-0148 | 1.0 |
| 2 | BBTD-3-62 | | BRUSH-BERYLM | PAD-TSTR,1.05 MD X 1.563 LG | 83-1690-0187 | 1.0 |
| 3 | 23059A017 | | MINCOM | CHAS-COMP MTG,SIG ELECTRONICS | 83-3310-0052 | 1.0 |
| 4 | 23059A011 | D | MINCOM | PLATE-MTG,METER MODULE | 83-3320-1126 | 1.0 |
| 5 | 23059A008 | | MINCOM | BRKT-METER MTG,SIG ELECTRONICS | 83-3320-1131 | 1.0 |
| 6 | 23059A009 | | MINCOM | SPACER-METER PANEL,SIG ELEC | 83-3350-[illegible] | [illegible] |
| 7 | 23059A055 | F | MINCOM | P.C. BD ASSY-PWR SUP,SIG ELEC | 83-4930-1014 | 1.0 |
| 8 | | | | NUT-HEX,SM PATT,6-32 X .250 MD | 83-9260-2202 | 7.0 |
| 9 | MS35206-227 | | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 23.0 |
| 10 | | | | SCREW-MACH,PAN HD,6-32 X 9/16 | 83-9260-[illegible] | [illegible] |
| 11 | | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4012 | 25.0 |
| 12 | MS35338-41 | | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 25.0 |
| 13 | 7856 | | WALSCO | INSULATOR-WASHER,.140 ID | 83-9630-0036 | 2.0 |
| 14 | 1414-6 | | HH SMITH | TERM STRIP-SOLDERING,#6 SCREW MTG | 83-9630-[illegible] | 1.0 |

M23 RRM 2-69

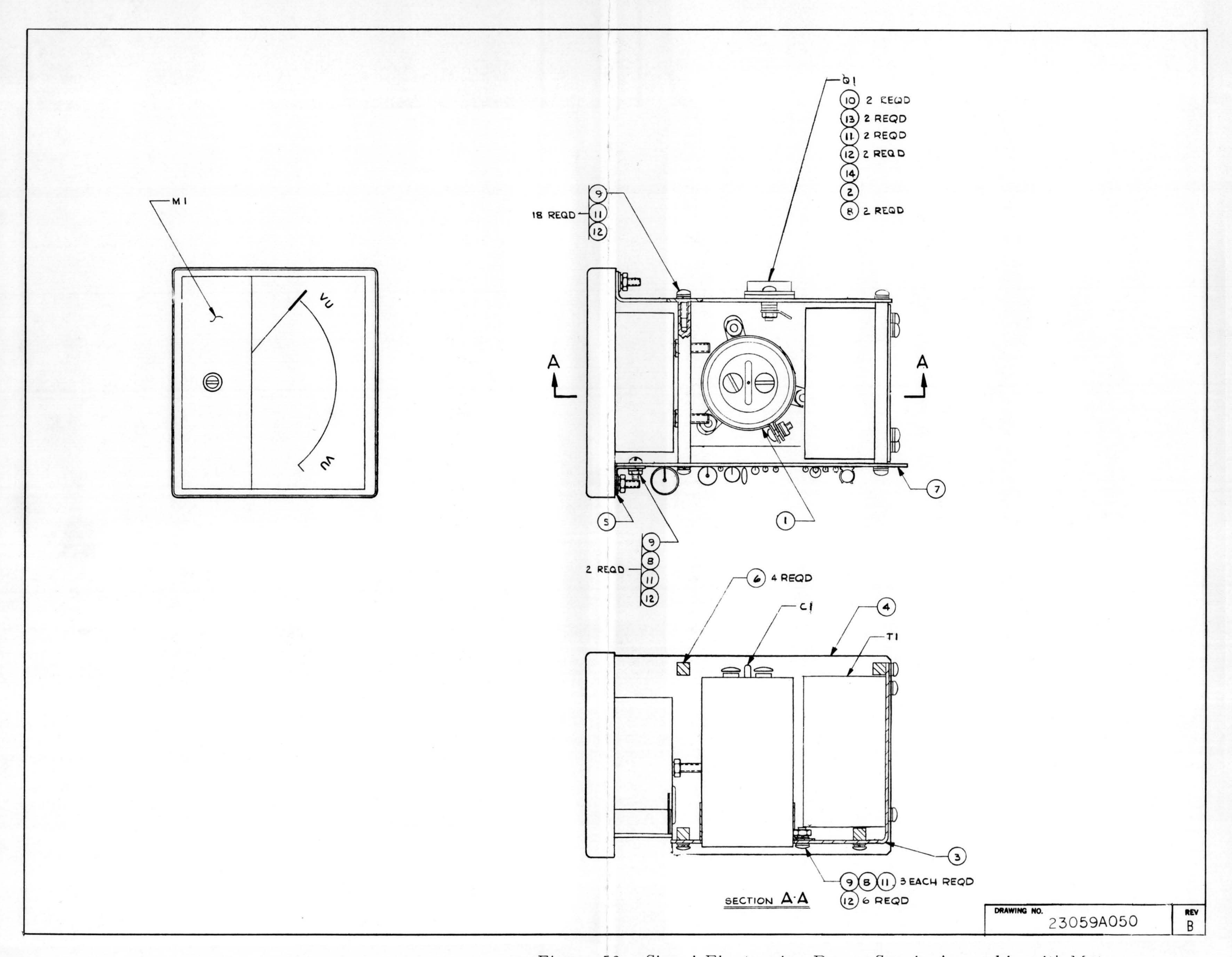



Figure 50. Signal Electronics Power Supply Assembly with Meter

P A R T S   L I S T          PL 23059A055          REV F

TITLE  P.C. BD ASSY-PWR SUP,SIG ELEC          CATALOG NO. 83-4930-1014

------------------- M A T E R I A L   R E Q U I R E M E N T S -------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C2,C4 | MIL CS13AC221 | MIL STD | CAP-FXD,TA, 47UF 35V 20% | 83-1510-6085 | 2.0 |
| C3 | TYPE BPD | AEROVOX | CAP-FXD,CER, 1000PF 1000V GMV | 83-1510-1024 | 1.0 |
| CR1,CR2,CR3,CR4,CR5 | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 5.0 |
| CR6 | 1N754A | TEXAS INST | DIODE-SI, ZENER, 6.8V 400 MW | 83-1530-0097 | 1.0 |
| F1 | 31201.5 | LITTELFUSE | FUSE-3AG-1.5 AMP. | 83-7550-8009 | 1.0 |
| Q2,Q3,Q4 | 2N3417 | G.E. | TSTR-SILICON,NPN,SMALL SIGNAL | 83-1530-2236 | 3.0 |
| R1 | BWH | INTNATNL RES | RESISTOR-WW 1 OHM, 1W; 10% | 83-1520-8261 | 1.0 |
| R2 | 4334 | OHMITE | RES-FXD,W/W,1.5 OHM 3 W 5 % | 83-1520-7771 | 1.0 |
| R3 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 1.0 |
| R4,R6 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 2.0 |
| R5 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R7 | 0A781-7372 | MINCOM SPEC | RES-FXD,FILM,22K OHM,1/2W,2% S | 83-1520-7372 | 1.0 |
| R8 | 0A781-7368 | MINCOM SPEC | RES-FXD,FILM,7.5K OHM,1/2W,2%S | 83-1520-7368 | 1.0 |
| R11 | LITTLE DEVIL | OHMITE | RES-FXD,COMP,270 OHM 1W 5% | 83-9520-4091 | 1.0 |
| R12 | RC32GF3315 | MIL-R-11076 | RESISTOR-CARBON, 330 OHM 1W-5% | 83-9520-4140 | 1.0 |
| R13 | LITTLE DEVIL | OHMITE | RESISTOR-CAR, 220 OHM-1W-5% | 83-9520-4137 | 1.0 |
| 1 | 101003 | LITTLEFUSE | CLIP-FUSE,LUG,PHOSPHOR BRONZE | 83-1620-0190 | 2.0 |
| 2 | 23059A056 | D MINCOM | P.C.BD-POWER SUPPLY | 83-3640-0597 | 1.0 |
| 3 | SE-44 BRASS | UNITED SHOE | EYELET-BRASS,FLANGED,.112X.121 | 83-7290-0091 | 2.0 |
| 4 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 3.0 |
| 5 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |

PARTS LIST    PL 23059A060    REV G

TITLE P.C. BD ASSY-LNE AMP,SIG ELECT    CATALOG NO. 83-4930-1091

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 1.0 |
| C2,C6 | TSD4-20-226 | COMP INC | CAP-FXD,TA, 22UF 20V 20% | 83-1510-6203 | 2.0 |
| C3 | 610B1B103J | ELECTRO CUBE | CAP-FXD,POLYCARBON,.01UF,100V | 83-1510-4227 | 1.0 |
| C4,C5 | BR150-50 | CORNELL DUBL | CAP-FXD,ELECT, 150UF 50V | 83-1510-2212 | 2.0 |
| C7 | TSD5-20-476 | COMP INC | CAP-FXD,TA, 47UF 20V 20% | 83-1510-6199 | 1.0 |
| C8 | DM15F500J | ARCO | CAP-FXD,MICA, 50PF 500V 5% | 83-1510-5148 | 1.0 |
| C9 | TSD1-35-105 | COMP INC | CAP-FXD,TA, 1UF 35V 20% | 83-1510-6208 | 1.0 |
| C10 | TSD5-10-157 | COMP INC | CAP-FXD,TA, 150UF 10V 20% | 83-1510-6245 | 1.0 |
| C11,C12 | TYPE BPD | AEROVOX | CAP-FXD,CER, 1000PF 1000V GMV | 83-1510-1024 | 2.0 |
| C13 | DM15F201J | ARCO | CAP-FXD,MICA, 200PF 500V 5% | 83-1510-5214 | 1.0 |
| C14 | BR500-25 | CORNELL DUBL | CAP-FXD,ELECT, 500UF 25V | 83-1510-2044 | 1.0 |
| C15 | P222MC | HOPKINS | CAP-FXD,PLSTC, .22UF 200V 5% | 83-1510-4167 | 1.0 |
| CR1,CR2,CR3,CR4,CR5,CR6, | 1N4002 | MOTOROLA | RECT-SI,SEMICOND,100PIV, 1 A | 83-1530-0122 | 7.0 |
| CR7 | | | | | |
| Q1,Q2,Q3 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 3.0 |
| Q4 | 2N3638 | FAIRCHILD | TSTR-SI,PNP, SW, 25 VCB | 83-1530-2155 | 1.0 |
| Q5,Q6 | 2N3054 | R.C.A. | TSTR-SI,NPN, H PWR, 100 HFE | 83-1530-2227 | 2.0 |
| R1 | 0A781-7362 | MINCOM SPEC | RES-FXD,FILM,3.6K OHM,1/2W,2%S | 83-1520-7362 | 1.0 |
| R2,R17,R21 | 0A781-7175 | MINCOM SPEC | RES-FXD,FILM,1K OHM,1/2W,2% S | 83-1520-7175 | 3.0 |
| R3 | 0A781-7368 | MINCOM SPEC | RES-FXD,FILM,7.5K OHM,1/2W,2%S | 83-1520-7368 | 1.0 |
| R4 | 77PR1K | BECKMAN | RES-VAR,COMP,1K OHM,3/4 W, 10% | 83-1520-1211 | 1.0 |
| R5,R8,R15,R22 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 4.0 |
| R6 | ,LITTLE DEVIL | OHMITE | RES-FXD, COMP, 820KOHM 1/2W 5 | 83-9520-3218 | 1.0 |
| R7 | 0A781-7398 | MINCOM SPEC | RES-FXD,FILM,430K OHM,1/2W,2%S | 83-1520-7398 | 1.0 |
| R9 | 0A781-7359 | MINCOM SPEC | RES-FXD,FILM,1.2K OHM,1/2W,2%S | 83-1520-7359 | 1.0 |
| R10,R12 | 0A781-7221 | MINCOM SPEC | RES-FXD,FILM,100 OHM,1/2W,2% S | 83-1520-7221 | 2.0 |
| R11 | 0A781-7346 | MINCOM SPEC | RES-FXD,FILM,200 OHM,1/2W,2% S | 83-1520-7346 | 1.0 |
| R13 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 1.0 |

PARTS LIST    PL 23059A060    REV G

TITLE P.C. BD ASSY-LNE AMP,SIG ELECT    CATALOG NO. 83-4930-1091

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH | CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|---|
| R14 | 0A781-7263 | | MINCOM SPEC | RES-FXD,FILM,2K OHM,1/2W,2% | S | 83-1520-7263 | 1.0 |
| R16 | 0A781-7219 | | MINCOM SPEC | RES-FXD,FILM,3K OHM,1/2W,2% | S | 83-1520-7219 | 1.0 |
| R18 | 0A781-7344 | | MINCOM SPEC | RES-FXD,FILM,120 OHM,1/2W,2% | S | 83-1520-7344 | 1.0 |
| R19,R20 | 0A781-7357 | | MINCOM SPEC | RES-FXD,FILM,750 OHM,1/2W,2% | S | 83-1520-7357 | 2.0 |
| R23 | 0A781-7329 | | MINCOM SPEC | RES-FXD,FILM,22 OHM,1/2W,2% | S | 83-1520-7329 | 1.0 |
| R24 | LITTLE DEVIL | | OHMITE | RES-FXD,COMP,2.7 OHM 1/2W 5% | | 83-9520-3258 | 1.0 |
| R25 | 0A781-7360 | | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2% | S | 83-1520-7360 | 1.0 |
| S1,S2 | TYPE G350-PC | | CONTL WIRT | SWITCH-SLIDE, DPDT,125V 3AMP | | 83-1550-5212 | 2.0 |
| TP1 | 3-582118-9 | | AMP INC | JACK-TIP,.156 WD X .460 DP | | 83-1610-0752 | 1.0 |
| 1 | 23059A061 | F | MINCOM | P.C. BD-LINE AMP,SIGNAL ELECT | | 83-3640-0668 | 1.0 |
| 2 | 00000A667 | B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | | ESNA | PIN-SPRING, .094 DIA X .250 LG | | 83-7280-0270 | 1.0 |
| 4 | 00000A734-4 | B | MINCOM | LABEL-IDENT,P.C. BD,*6* | | 83-3550-1449 | 1.0 |
| 6 | MS35206-215 | | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | | 83-9260-4515 | 4.0 |
| 7 | | | | NUT-HEX,SM PATT,4-40 X .188 WD | | 83-9260-2201 | 4.0 |
| 8 | | | | WASHER-FLAT,.219 OD X .125 ID | | 83-9261-4012 | 4.0 |
| 9 | MS35338-40 | | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | | 83-9261-4303 | 4.0 |
| 10 | 7717-2 | | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | | 83-9690-0191 | 3.0 |

PARTS LIST — PL 23059B090-1 — REV A

TITLE P.C.BD ASSY-PREAMP, OVERDUB 7.5/15 — CATALOG NO. 83-4930-2180

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1,C6 | TSD4-20-226 | COMP INC | CAP-FXD,TA, 22UF 20V 20% | 83-1510-6203 | 2.0 |
| C2 | DM15F271J | ARCO | CAP-FXD,MICA, 270PF 500V 5% | 83-1510-5096 | 1.0 |
| C3 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C4 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C5 | E3XFR | MIDWEC | CAP-FXD,PLSTC, .010UF 100V 5% | 83-1510-4449 | 1.0 |
| C7,C8 | TYPE E3FR | MIDWEC | CAP-FXD, PLS .0068UF 100V 5% | 83-1510-4447 | 2.0 |
| C9,C10 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| C11 | DM15F501J | ARCO | CAP-FXD,MICA, 500PF 500V 5% | 83-1510-5120 | 1.0 |
| K1 | 701-3 | ELEC-TROL | RELAY-SPDT, 2K OHM 24VDC | 83-1550-3620 | 1.0 |
| K2 | 201-3 | ELECTROL | RELAY-SPST, 2K OHM 24 V DC | 83-1550-3621 | 1.0 |
| L1 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 1.0 |
| Q1,Q2,Q3,Q4,Q5 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 5.0 |
| R1,R5 | LITTLE DEVIL | OHMITE | RES-FXD,COMP, 1M OHM 1/2W 5% | 83-9520-3220 | 2.0 |
| R2 | 0A781-7344 | MINCOM SPEC | RES-FXD,FILM,120 OHM,1/2W,2% S | 83-1520-7344 | 1.0 |
| R3 | 0A781-7393 | MINCOM | RES-FXD,FILM,270K OHM,1/2W,2%S | 83-1520-7393 | 1.0 |
| R4 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R6,R25 | 0A781-7373 | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 2.0 |
| R7,R18,R21 | 0A781-7389 | MINCOM SPEC | RES-FXD,FILM,180K OHM,1/2W,2%S | 83-1520-7389 | 3.0 |
| R8 | 0A781-7174 | MINCOM SPEC | RES-FXD,FILM,390 OHM,1/2W,2% S | 83-1520-7174 | 1.0 |
| R9 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R10 | 0A781-7375 | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 1.0 |
| R11,R12,R13,R14,R15 | 0A781-7201 | MINCOM SPEC | RES-FXD,FILM,1.8K OHM,1/2W,2%S | 83-1520-7201 | 5.0 |
| R16 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 1.0 |
| R17 | 79P R5K | BECKMAN | RES-VAR,CER, 5 K OHM,3/4W,10% | 83-1520-1420 | 1.0 |
| R19,R22 | 79P R1MEG | BECKMAN | RES-VAR, FILM, 1 MEG OHM | 83-1520-1421 | 2.0 |
| R20,R23 | 79P R20K | BECKMAN | RES-VAR,FILM, 20 K OHM | 83-1520-1422 | 2.0 |
| R24 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| R26 | 0A781-7217 | MINCOM SPEC | RES-FXD,FILM,680 OHM,1/2W,2% S | 83-1520-7218 | 1.0 |
| T1 | TR-145 BV-35845 | BEYER XMFR | XMFR-AF,2.0 OHM PRIM-95 OHM | 83-1540-1284 | 1.0 |
| 1 | 23059B091 D | MINCOM | PC BD-PREAMP, OVERDUB | 83-3640-1507 | 1.0 |
| 2 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 4 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 5.0 |
| 5 | 00000A734-7 B | MINCOM | LABEL-IDENT,P.C. BD,*7 9* | 83-3550-1452 | 1.0 |
| 6 | 23059A092 | MINCOM | BRKT-COMP,P.C.BD,PREAMP | 83-3320-1974 | 1.0 |

PARTS LIST    PL 23059B090-2    REV A

TITLE PC BD ASSY-PREAMP,OVERDUB15/30    CATALOG NO. 83-4930-2511

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1,C6 | TSD4-20-226 | COMP INC | CAP-FXD,TA, 22UF 20V 20% | 83-1510-6203 | 2.0 |
| C2 | DM15F271J | ARCO | CAP-FXD,MICA, 270PF 500V 5% | 83-1510-5096 | 1.0 |
| C3 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C4 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C5 | E3XFR | MIDWEC | CAP-FXD,PLSTC, .010UF 100V 5% | 83-1510-4449 | 1.0 |
| C7,C8 | TYPE E3FR | MIDWEC | CAP-FXD, PLS .0068UF 100V 5% | 83-1510-4447 | 2.0 |
| C9,C10 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| C11 | DM15F501J | ARCO | CAP-FXD,MICA, 500PF 500V 5% | 83-1510-5120 | 1.0 |
| K1 | 701-3 | ELEC-TROL | RELAY-SPDT, 2K OHM 24VDC | 83-1550-3620 | 1.0 |
| K2 | 201-3 | ELECTROL | RELAY-SPST, 2K OHM 24 V DC | 83-1550-3621 | 1.0 |
| L1 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 1.0 |
| Q1,Q2,Q3,Q4,Q5 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 5.0 |
| R1,R5 | LITTLE DEVIL | OHMITE | RES-FXD,COMP, 1M OHM 1/2W 5% | 83-9520-3220 | 2.0 |
| R2 | 0A781-7344 | MINCOM SPEC | RES-FXD,FILM,120 OHM,1/2W,2% S | 83-1520-7344 | 1.0 |
| R3 | 0A781-7393 | MINCOM | RES-FXD,FILM,270K OHM,1/2W,2%S | 83-1520-7393 | 1.0 |
| R4 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R6,R25 | 0A781-7373 | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 2.0 |
| R7,R18,R21 | 0A781-7389 | MINCOM SPEC | RES-FXD,FILM,180K OHM,1/2W,2%S | 83-1520-7389 | 3.0 |
| R8 | 0A781-7174 | MINCOM SPEC | RES-FXD,FILM,390 OHM,1/2W,2% S | 83-1520-7174 | 1.0 |
| R9 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R10 | 0A781-7375 | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 1.0 |
| R11,R12,R15 | 0A781-7201 | MINCOM SPEC | RES-FXD,FILM,1.8K OHM,1/2W,2%S | 83-1520-7201 | 3.0 |
| R13,R14 | 0A781-7264 | MINCOM SPEC | RES-FXD,FILM,910 OHM,1/2W,2% S | 83-1520-7264 | 2.0 |
| R16 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 1.0 |
| R17 | 79P R5K | BECKMAN | RES-VAR,CER, 5 K OHM,3/4W,10% | 83-1520-1420 | 1.0 |
| R19,R22 | 79P R1MEG | BECKMAN | RES-VAR, FILM, 1 MEG OHM | 83-1520-1421 | 2.0 |
| R20,R23 | 79P R20K | BECKMAN | RES-VAR,FILM, 20 K OHM | 83-1520-1422 | 2.0 |
| R24 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |

PARTS LIST — PL 23059B090-2 — REV A

TITLE PC BD ASSY-PREAMP,OVERDUB15/30 — CATALOG NO. 83-4930-2511

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| R26 | 0A781-7217 | MINCOM SPEC | RES-FXD,FILM,680 OHM,1/2W,2% S | 83-1520-7218 | 1.0 |
| T1 | TR-145 BV-35845 | BEYER XMFR | XMFR-AF,2.0 OHM PRIM-95 OHM | 83-1540-1284 | 1.0 |
| 1 | 23059B091 D | MINCOM | PC BD-PREAMP, OVERDUB | 83-3640-1507 | 1.0 |
| 2 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 4 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 5.0 |
| 6 | 23059A092 | MINCOM | BRKT-COMP,P.C.BD,PREAMP | 83-3320-1974 | 1.0 |

P A R T S   L I S T        PL 23059A110        REV A

TITLE  P.C. BD ASSY-EXTENDER        CATALOG NO. 83-4930-1746

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23059A111 | B MINCOM | P.C. BD-EXTENDER | 83-3640-1139 | 1.0 |
| 2 | 2VK22S/1-2 | VIKING | CONN-P.C.,ELEC,PIERCD, 22 CON | 83-1610-0845 | 1.0 |
| 3 | MS35206-217 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/2 | 83-9260-4517 | 2.0 |
| 4 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 2.0 |
| 5 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 6 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |
| 7 | TFT-200/22 | ALPHA WIRE | TUBING-TEFLON,#22,.027 ID,NAT | 83-7910-0388 | AR |

PARTS LIST PL 23059A130 REV D

TITLE P.C. BD ASSY-DYNATRACK,RECORD CATALOG NO. 83-4930-1006

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 3.0 |
| C1 | TSD-1-20-225 | COMP INC | CAP-FXD,TA, 2.2UF 20V 20% | 83-1510-6240 | 1.0 |
| C2,C4,C7,C9 | TSD3-15-226 | COMP INC | CAP-FXD,TA, 22UF 15V 20% | 83-1510-6257 | 4.0 |
| C3 | TSD5-10-157 | COMP INC | CAP-FXD,TA, 150UF 10V 20% | 83-1510-6245 | 1.0 |
| C5,C11 | 112A1C223J | ELECTRO CUBE | CAP-FXD,PAPER, .022UF 200V 5% | 83-1510-4475 | 2.0 |
| C6,C10 | 112A1A104J | ELECTRO-CUBE | CAP-FXD,PAPER, .10UF 50V 5% | 83-1510-4310 | 2.0 |
| C8 | DM15F501J | ARCO | CAP-FXD,MICA, 500PF 500V 5% | 83-1510-5120 | 1.0 |
| C12,C13 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| C14 | TSD5-20-476 | COMP INC | CAP-FXD,TA, 47UF 20V 20% | 83-1510-6199 | 1.0 |
| C15 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C16 | 192P15392 | SPRAGUE | CAP-FXD,PAPER, .015UF,200V,10% | 83-1510-4416 | 1.0 |
| C18 | WMF1S47 | CORNL-DUBLR | CAP-FXD,PLSTC,.047UF 100V 10% | 83-1510-4481 | 1.0 |
| C19 | 4610 | ARCO | CAP-VAR,MICA,190-900 PF | 83-1510-6252 | 1.0 |
| CR1,CR2 | 1N270 | HUGHES | DIODE-GE,GEN PUR,100PIV, 60 MA | 83-1530-0263 | 2.0 |
| L1,L2 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 2.0 |
| Q1 | 2N3684 | | TSTR-SI,N-CHAN,FLD EFFECT 50MA | 83-1530-2244 | 1.0 |
| Q2,Q3,Q4 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 3.0 |
| Q5 | 2N3405 | G.E. | TSTR-SI,NPN,GEN PUR,50VCE | 83-1530-2232 | 1.0 |
| Q6,Q7 | 2N2614 | | TSTR-GE,PNP, SIGNAL, 40VCB | 83-1530-2233 | 2.0 |
| R1,R25 | 0A781-7379 | MINCOM SPEC | RES-FXD,FILM,47K OHM,1/2W,2% S | 83-1520-7379 | 2.0 |
| R2 | 0A781-7369 | MINCOM SPEC | RES-FXD,FILM,8.2K OHM,1/2W,2%S | 83-1520-7369 | 1.0 |
| R3 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| R4,R28,R32 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 3.0 |
| R5 | 0A781-7387 | MINCOM SPEC | RES-FXD,FILM,100K OHM,1/2W,2%S | 83-1520-7387 | 1.0 |
| R6 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R7 | 0A781-7349 | MINCOM SPEC | RES-FXD,FILM,300 OHM,1/2W,2% S | 83-1520-7349 | 1.0 |
| R8,R29,R30 | 0A781-7147 | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 3.0 |
| R9,R13 | 0A781-7354 | MINCOM SPEC | RES-FXD,FILM,510 OHM,1/2W,2% S | 83-1520-7354 | 2.0 |
| R10 | 0A781-7375 | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 1.0 |
| R11 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 1.0 |

P A R T S   L I S T   PL 23059A130   REV D

TITLE P.C. BD ASSY-DYNATRACK,RECORD   CATALOG NO. 83-4930-1006

- - - - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| R12,R19 | 0A781-7359 | MINCOM SPEC | RES-FXD,FILM,1.2K OHM,1/2W,2%S | 83-1520-7359 | 2.0 |
| R14 | 0A781-7349 | MINCOM SPEC | RES-FXD,FILM,300 OHM,1/2W,2% S | 83-1520-7349 | 1.0 |
| R15 | 0A781-7361 | MINCOM SPEC | RES-FXD,FILM,2.7K OHM,1/2W,2%S | 83-1520-7361 | 1.0 |
| R16 | 0A781-7370 | MINCOM SPEC | RES-FXD,FILM,9.1K OHM,1/2W,2%S | 83-1520-7370 | 1.0 |
| R17 | 0A781-7264 | MINCOM SPEC | RES-FXD,FILM,910 OHM,1/2W,2% S | 83-1520-7264 | 1.0 |
| R18 | 0A781-7175 | MINCOM SPEC | RES-FXD,FILM,1K OHM,1/2W,2% S | 83-1520-7175 | 1.0 |
| R20 | 0A781-7342 | MINCOM SPEC | RES-FXD,FILM,82 OHM,1/2W,2% S | 83-1520-7342 | 1.0 |
| R21 | 0A781-7337 | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 1.0 |
| R22 | 77PR100 | BECKMAN | RES-VAR,COMP,100 OHM,3/4 W,10% | 83-1520-1153 | 1.0 |
| R23 | 0A781-7333 | MINCOM SPEC | RES-FXD,FILM,33 OHM,1/2W,2% S | 83-1520-7333 | 1.0 |
| R24 | 0A781-7345 | MINCOM SPEC | RES-FXD,FILM,180 OHM,1/2W,2% S | 83-1520-7345 | 1.0 |
| R26 | 77PR1K | BECKMAN | RES-VAR,COMP,1K OHM,3/4 W, 10% | 83-1520-1211 | 1.0 |
| R31 | 0A781-7372 | MINCOM SPEC | RES-FXD,FILM,22K OHM,1/2W,2% S | 83-1520-7372 | 1.0 |
| S1 | TYPE G350-PC | CONTL WIRT | SWITCH-SLIDE, DPDT,125V 3AMP | 83-1550-5212 | 1.0 |
| TP1,TP2 | 3-582118-9 | AMP INC | JACK-TIP,.156 WD X .460 DP | 83-1610-0752 | 2.0 |
| 1 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 3.0 |
| 2 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 23059A016 A | MINCOM | BRACKET-COMPONENT MTG,SIG ELEC | 83-3320-1132 | 1.0 |
| 4 | 00000A734-8 B | MINCOM | LABEL-IDENT,P.C. BD,*3D* | 83-3550-1453 | 1.0 |
| 5 | 23059A131 | MINCOM | P.C. BD-DYNATRACK,RECORD | 83-3640-0672 | 1.0 |
| 6 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 7 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 1.0 |
| 8 | MS35649-42 | MIL STD | NUT-HEX,PLAIN,4-40 X .250 WD | 83-9260-2003 | 1.0 |
| 9 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 1.0 |
| 10 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 1.0 |
| 11 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |

PARTS LIST PL 23059A140 REV C

TITLE P.C.BD ASSY-DYNATRACK,REPRO CATALOG NO. 83-4930-1964

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1,C6,C10 | TSD4-20-226 | COMP INC | CAP-FXD,TA, 22UF 20V 20% | 83-1510-6203 | 3.0 |
| C2 | DM15F271J | ARCO | CAP-FXD,MICA, 270PF 500V 5% | 83-1510-5096 | 1.0 |
| C3 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C4 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C5,C9 | E3XFR | MIDWEC | CAP-FXD,PLSTC, .010UF 100V 5% | 83-1510-4449 | 2.0 |
| C7 | TYPE E3FR | MIDWEC | CAP-FXD,PLSTC,.0047UF 100V 5% | 83-1510-4446 | 1.0 |
| C8 | DM15F621J | ARCO | CAP-FXD,MICA, 620PF 300V 5% | 83-1510-5123 | 1.0 |
| C11 | TYPE E3FR | MIDWEC | CAP-FXD, PLS .0068UF 100V 5% | 83-1510-4447 | 1.0 |
| C12 | E3XFR | MIDWEC | CAP-FXD,PLSTC,.033UF 100V 5% | 83-1510-4452 | 1.0 |
| C13 | E3XFR | MIDWEC | CAP-FXD, PLSTC .047UF 100V 5% | 83-1510-4453 | 1.0 |
| C14 | TSD2-35-225 | COMP INC | CAP-FXD,TA, 2.2UF 35V 20% | 83-1510-6207 | 1.0 |
| C15 | E3XFR | MIDWEC | CAP-FXD,PLSTC, .10UF,100V, 5% | 83-1510-4456 | 1.0 |
| C16 | 112A1C824 | ELECTRO CUBE | CAP-FXD PAPER .82UF 200V 20% | 83-1510-4309 | 1.0 |
| C17,C18 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| DS1 | NE-2 | CHICAGO MIN | LAMP-GLOW, NEON | 83-1550-2596 | 1.0 |
| Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9, Q10 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 10.0 |
| Q11 | 2N3638 | FAIRCHILD | TSTR-SI,PNP, SW, 25 VCB | 83-1530-2155 | 1.0 |
| Q12 | 2N4056 | GE | TSTR-2N4056, SI, HIGH VOLTAGE | 83-1530-2332 | 1.0 |
| R1,R5 | LITTLE DEVIL | OHMITE | RES-FXD,COMP, 1M OHM 1/2W 5% | 83-9520-3220 | 2.0 |
| R2,R31 | 0A781-7344 | MINCOM SPEC | RES-FXD,FILM,120 OHM,1/2W,2% S | 83-1520-7344 | 2.0 |
| R3 | 0A781-7393 | MINCOM | RES-FXD,FILM,270K OHM,1/2W,2%S | 83-1520-7393 | 1.0 |
| R4 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R6,R26 | 0A781-7373 | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 2.0 |
| R7,R47 | 0A781-7389 | MINCOM SPEC | RES-FXD,FILM,180K OHM,1/2W,2%S | 83-1520-7389 | 2.0 |
| R8 | 0A781-7174 | MINCOM SPEC | RES-FXD,FILM,390 OHM,1/2W,2% S | 83-1520-7174 | 1.0 |
| R9,R17,R37 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 3.0 |
| R10 | 0A781-7375 | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 1.0 |
| R11,R12,R13,R14,R36,R39 | 0A781-7201 | MINCOM SPEC | RES-FXD,FILM,1.8K OHM,1/2W,2%S | 83-1520-7201 | 6.0 |
| R15,R27 | 79P R5K | BECKMAN | RES-VAR,CER, 5 K OHM,3/4W,10% | 83-1520-1420 | 2.0 |
| R16,R29,R32,R41 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 4.0 |

M23 RRM 2-69

PARTS LIST PL 23059A140 REV C

TITLE P.C.BD ASSY-DYNATRACK,REPRO CATALOG NO. 83-4930-1964

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| R18,R33 | 0A781-7387 | | MINCOM SPEC | RES-FXD,FILM,100K OHM,1/2W,2%S | 83-1520-7387 | 2.0 |
| R19 | 0A781-7383 | | MINCOM SPEC | RES-FXD,FILM,68K OHM,1/2W,2% S | 83-1520-7383 | 1.0 |
| R20 | LITTLE DEVIL | | OHMITE | RESISTOR-CAR, 1.5M 1/2W 5% | 83-9520-3224 | 1.0 |
| R21 | LITTLE DEVIL | | OHMITE | RES-FXD,COMP,10M OHM 1/2 W 5% | 83-9520-3250 | 1.0 |
| R22 | 0A781-7399 | | MINCOM SPEC | RES-FXD,FILM,470K OHM,1/2W,2%S | 83-1520-7399 | 1.0 |
| R23 | 0A781-7363 | | MINCOM SPEC | RES-FXD,FILM,3.9K OHM,1/2W,2%S | 83-1520-7363 | 1.0 |
| R24 | 0A781-7372 | | MINCOM SPEC | RES-FXD,FILM,22K OHM,1/2W,2% S | 83-1520-7372 | 1.0 |
| R25,R38 | 0A781-7360 | | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 2.0 |
| R28 | 0A781-7391 | | MINCOM SPEC | RES-FXD,FILM,220K OHM,1/2W,2%S | 83-1520-7391 | 1.0 |
| R30 | 0A781-7361 | | MINCOM SPEC | RES-FXD,FILM,2.7K OHM,1/2W,2%S | 83-1520-7361 | 1.0 |
| R34 | 0A781-7149 | | MINCOM SPEC | RES-FXD,FILM,3.3K OHM,1/2W,2%S | 83-1520-7149 | 1.0 |
| R35 | 0A781-7365 | | MINCOM SPEC | RES-FXD,FILM,5.6K OHM,1/2W,2%S | 83-1520-7365 | 1.0 |
| R40 | 0A781-7337 | | MINCOM SPEC | RES-FXD,FILM,47 OHM,1/2W,2% S | 83-1520-7337 | 1.0 |
| R42,R43 | 0A781-7379 | | MINCOM SPEC | RES-FXD,FILM,47K OHM,1/2W,2% S | 83-1520-7379 | 2.0 |
| R44 | 0A781-7381 | | MINCOM SPEC | RES-FXD,FILM,56K OHM,1/2W,2% S | 83-1520-7381 | 1.0 |
| R45,R51 | 0A781-7145 | | MINCOM SPEC | RES-FXD,FILM,12K OHM,1/2W,2% S | 83-1520-7145 | 2.0 |
| R46 | 0A781-7353 | | MINCOM SPEC | RES-FXD,FILM,470 OHM,1/2W,2% S | 83-1520-7353 | 1.0 |
| R48 | 79P R1MEG | | BECKMAN | RES-VAR, FILM, 1 MEG OHM | 83-1520-1421 | 1.0 |
| R49 | 79P R20K | | BECKMAN | RES-VAR,FILM, 20 K OHM | 83-1520-1422 | 1.0 |
| R50 | CK1101 | | RAYTHEON | RES-VAR,LIGHT ACTIVATED | 83-1520-1433 | 1.0 |
| R52 | 0A781-7142 | | MINCOM SPEC | RES-FXD,FILM,5.1K OHM,1/2W,2%S | 83-1520-7142 | 1.0 |
| S1 | G128 | | CONT WIRT | SWITCH-SLIDE, DP3T,125 V .5AMP | 83-1550-5430 | 1.0 |
| S2 | 7101RPC | | C & K COMP | SWITCH-TOGGLE, SPDT,28VDC | 83-1550-5429 | 1.0 |
| 1 | 23059A141 | E | MINCOM | P.C.BD-DYNATRACK,REPRODUCE | 83-3640-1274 | 1.0 |
| 2 | 00000A667 | B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 4 | 7717-2 | | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 10.0 |
| 5 | 100-300-4-3 | | ATLEE CORP | CLIP-SPG TENS,.093 MTG HOLE | 83-1620-0091 | 1.0 |

PARTS LIST PL 23059A140 REV C

TITLE P.C.BD ASSY-DYNATRACK,REPRO CATALOG NO. 83-4930-1964

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 6 | MS35338-39 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#2 | 83-9261-4301 | 4.0 |
| 7 | | | WASHER-FLAT,SM PATT,#2 | 83-9261-4011 | 5.0 |
| 8 | | | NUT-HEX,SM PATT,2-56 X .156 WD | 83-9260-2206 | 6.0 |
| 9 | MS35206-202 | MIL STD | SCREW-MACH,PAN HD,2-56 X 3/16 | 83-9260-4501 | 4.0 |
| 10 | 00000A734-9 | MINCOM | LABEL-IDENT,P.C. BD *8D* | 83-3550-1454 | 1.0 |

PARTS LIST　　　PL 23059A170　　　REV B

TITLE P.C.BD ASSY-PREAMP,NAB,REPRO　　　CATALOG NO. 83-4930-1940

MATERIAL REQUIREMENTS

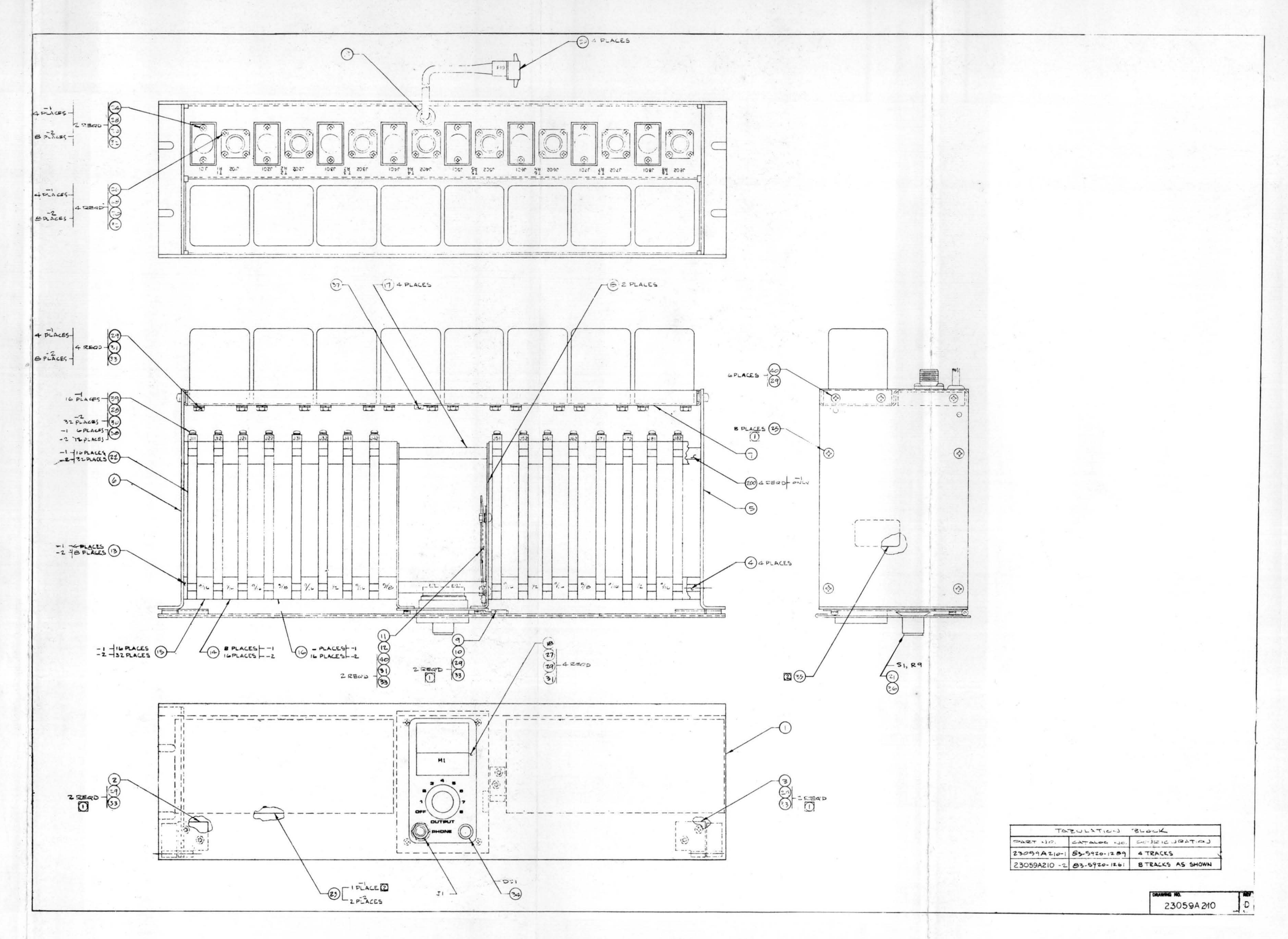
| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| C1,C6 | TSD4-20-226 | | COMP INC | CAP-FXD,TA, 22UF 20V 20% | 83-1510-6203 | 2.0 |
| C2 | DM15F271J | | ARCO | CAP-FXD,MICA, 270PF 500V 5% | 83-1510-5096 | 1.0 |
| C3 | TSD5-20-686 | | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C4 | TSD5-6-227 | | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C5 | E3XFR | | MIDWEC | CAP-FXD,PLSTC, .010UF 100V 5% | 83-1510-4449 | 1.0 |
| C7,C8 | TYPE E3FR | | MIDWEC | CAP-FXD, PLS .0068UF 100V 5% | 83-1510-4447 | 2.0 |
| C9,C15 | TSD5-35-156 | | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 2.0 |
| K1 | 701-3 | | ELEC-TROL | RELAY-SPDT, 2K OHM 24VDC | 83-1550-3620 | 1.0 |
| K2 | 201-3 | | ELECTROL | RELAY-SPST, 2K OHM 24 V DC | 83-1550-3621 | 1.0 |
| Q1,Q2,Q3,Q4,Q5 | 2N3391A | | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 5.0 |
| R1,R5 | LITTLE DEVIL | | OHMITE | RES-FXD,COMP, 1M OHM 1/2W 5% | 83-9520-3220 | 2.0 |
| R2 | 0A781-7344 | | MINCOM SPEC | RES-FXD,FILM,120 OHM,1/2W,2% S | 83-1520-7344 | 1.0 |
| R3 | 0A781-7393 | | MINCOM | RES-FXD,FILM,270K OHM,1/2W,2%S | 83-1520-7393 | 1.0 |
| R4 | 0A781-7350 | | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R6,R25 | 0A781-7373 | | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 2.0 |
| R7,R18,R21 | 0A781-7389 | | MINCOM SPEC | RES-FXD,FILM,180K OHM,1/2W,2%S | 83-1520-7389 | 3.0 |
| R8 | 0A781-7174 | | MINCOM SPEC | RES-FXD,FILM,390 OHM,1/2W,2% S | 83-1520-7174 | 1.0 |
| R9 | 0A781-7367 | | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R10 | 0A781-7375 | | MINCOM SPEC | RES-FXD,FILM,33K OHM,1/2W,2% S | 83-1520-7375 | 1.0 |
| R11,R12,R13,R14,R15 | 0A781-7201 | | MINCOM SPEC | RES-FXD,FILM,1.8K OHM,1/2W,2%S | 83-1520-7201 | 5.0 |
| R16 | 0A781-7147 | | MINCOM SPEC | RES-FXD,FILM,4.7K OHM,1/2W,2% | 83-1520-7147 | 1.0 |
| R17 | 79P R5K | | BECKMAN | RES-VAR,CER, 5 K OHM,3/4W,10% | 83-1520-1420 | 1.0 |
| R19,R22 | 79P R1MEG | | BECKMAN | RES-VAR, FILM, 1 MEG OHM | 83-1520-1421 | 2.0 |
| R20,R23 | 79P R20K | | BECKMAN | RES-VAR,FILM, 20 K OHM | 83-1520-1422 | 2.0 |
| R24 | 0A781-7360 | | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| 1 | 23059A191 | C | MINCOM | P.C.BD-PREAMP, NAB, OVERDUB | 83-3640-1265 | 1.0 |
| 2 | 00000A667 | B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 3 | 79-022-094-0250 | | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 4 | 7717-2 | | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 5.0 |
| 5 | 00000A734-5 | B | MINCOM | LABEL-IDENT,P.C. BD,*7* | 83-3550-1450 | 1.0 |

PARTS LIST PL 23059A210-2 REV D

TITLE HSG-SIG ELECT,REPRO ONLY,8 TRK CATALOG NO. 83-5920-1261

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| DS1 | 327 | | GENERAL ELEC | LAMP-INCANDESCENT, .04 AMP | 83-1550-2506 | 1.0 |
| J1 | N-111 | | SWITCHCRAFT | JACK-TEL,2 CONDUCTOR,INSULATED | 83-1610-0885 | 1.0 |
| J11,J12,J21,J22,J31,J32, J41,J42,J51,J52,J61,J62, J71,J72,J81,J82 | 2VK22S/1-2 | | VIKING | CONN-P.C.,ELEC,PIERCD, 22 CON | 83-1610-0845 | 16.0 |
| J101,J201,J301,J401,J501, J601,J701,J801 | D3M | | SWITCHCRAFT | CONN-RECP,ELEC,PNL MTG, 3 PIN | 83-1610-1106 | 8.0 |
| J102,J202,J302,J402,J502, J602,J702,J802 | MS3102E10SL-3P | | MIL STD | CONN-RECPT,BOX MTG,3 PIN CONT | 83-1610-1510 | 8.0 |
| M1 | 4140018-10 | | SIMPSON | METER ASSY-VU,-20 TO PLUS 3 | 83-1550-3094 | 1.0 |
| P10 | 1-480276-0 | | AMP INC | SHELL-CONN,RECT, .665 WD X.850 | 83-1610-0929 | 1.0 |
| R1,R2,R3,R4,R5,R6,R7,R8 | 0A781-7350 | | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 8.0 |
| R9 | 0A781-7362 | | MINCOM SPEC | RES-FXD,FILM,3.6K OHM,1/2W,2%S | 83-1520-7362 | 1.0 |
| S1 | PA-1005 | | CENTRALAB | SW-ROTARY,2 SECTIONS,2-111 POS | 83-1550-5279 | 1.0 |
| T1,T2,T3,T4,T5,T6,T7,T8 | 23059A029 | A | MINCOM | XMFR-AUDIO OUTPUT,SIGNAL ELECT | 83-3540-1109 | 8.0 |
| 1 | 23059A211 | | MINCOM | PANEL-FRONT | 83-3360-1053 | 1.0 |
| 2 | 23059A013-1 | B | MINCOM | HINGE-BUTT,DOOR LEAF,LH | 83-3270-0475 | 1.0 |
| 3 | 23059A013-2 | B | MINCOM | HINGE-BUTT,DOOR LEAF,RH | 83-3270-0476 | 1.0 |
| 4 | 23059A004 | B | MINCOM | SUPPORT-ROD,GUIDE,P.C. BOARD | 83-3340-0389 | 4.0 |
| 5 | 23059A001-1 | B | MINCOM | PLATE-HSG MTG,RH,SIG ELECT | 83-3320-1128 | 1.0 |
| 6 | 23059A001-2 | B | MINCOM | PLATE-MTG,HSNG,RH,SIGNAL ELECT | 83-3320-1129 | 1.0 |
| 7 | 23059A212 | C | MINCOM | PANEL-REAR | 83-3360-1054 | 1.0 |
| 8 | 23059A006-1 | D | MINCOM | PLATE-PANEL MTG,LH,SIG ELECT | 83-3320-1130 | 2.0 |
| 9 | 23059A014-3 | B | MINCOM | HINGE-BUTT,CHASSIS HALF | 83-3270-0479 | 1.0 |
| 10 | 23059A027 | B | MINCOM | ROD-DOOR STOP,SIGNAL ELECT | 83-3280-0418 | 1.0 |
| 11 | 23059A026 | B | MINCOM | BRACKET-SLOTTED,DOOR STOP | 83-3320-1127 | 1.0 |
| 12 | 23059A028 | B | MINCOM | SPRING-DOOR CATCH,SIG ELECT | 83-3280-0447 | 1.0 |
| 13 | R102-125 | | SCANBE | SPACER-GUIDE,P.C. BD,.125 THK | 83-1350-0385 | 8.0 |
| 14 | 00000A614-7 | G | MINCOM | SPACER-P.C. BD,CHAN, .500 LG | 83-3350-0236 | 16.0 |
| 15 | 00000A614-8 | G | MINCOM | SPACER-P.C. BD,CHAN,.562 LG | 83-3350-0237 | 32.0 |
| 16 | 00000A614-9 | G | MINCOM | SPACER-P.C. BD,CHAN,.625 LG | 83-3350-0238 | 16.0 |
| 17 | 00000A754-1 | | MINCOM | SPACER-CARD GUIDE, 2.937 LG | 83-3350-0529 | 4.0 |
| 18 | 23059A213 | D | MINCOM | PANEL-FRONT,COMPONENT MTG | 83-3360-1055 | 1.0 |
| 19 | 7036 | | WALSCO | GROMMET-PLST,.375 ID X .625 OD | 83-9630-0007 | 1.0 |
| 20 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 4.0 |




| TABULATION BLOCK | | |
|---|---|---|
| PART NO. | CATALOG NO. | CONFIGURATION |
| 23059A210-1 | 83-5920-1289 | 4 TRACKS |
| 23059A210-2 | 83-5920-1261 | 8 TRACKS AS SHOWN |

Figure 51. Reproduce Signal Electronics Housing

TITLE  HSG-SIG ELECT,REPRO ONLY,8 TRK          CATALOG NO. 83-5920-1261

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 21 | DS70-3-2 | RAYTHEON | KNOB-CONTROL,RD,SKIRTED | 83-1270-0487 | 1.0 |
| 22 | R-301-51A | SCANBE | GUIDE-P.C. BD,5.287 LG | 83-1340-0393 | 32.0 |
| 23 | 23059A214 | MINCOM | LABEL-I.D,DYNATRACK & NAB | 83-3550-1582 | 2.0 |
| 24 | MS35190-222 | MIL STD | SCREW-MACH,FH,4-40 X 5/16 | 83-9260-6503 | 16.0 |
| 25 | | | SCR-MACH,F HD,8-32 X .500 LG | 83-9260-6610 | 8.0 |
| 26 | MS35206-214 | MIL STD | SCREW-MACH,PAN HD,4-40 X 5/16 | 83-9260-4514 | 32.0 |
| 27 | MS35206-228 | MIL STD | SCREW-MACH,PAN HD,6-32 X 3/8 | 83-9260-4531 | 4.0 |
| 28 | | | WASHER-FLAT,.219 OD X .125 ID | 83-9261-4012 | 80.0 |
| 29 | | | WASHER-FLAT,SM PATT,#6 | 83-9261-4013 | 48.0 |
| 30 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 80.0 |
| 31 | MS35338-41 | MIL STD | WASHER-LOCK,SPLIT, #6 | 83-9261-4305 | 38.0 |
| 32 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 48.0 |
| 33 | | | NUT-HEX,SM PATT,6-32 X .250 WD | 83-9260-2202 | 40.0 |
| 34 | RDL-A1F1-0000 | TSTR ELECT | LIGHT-INDICATOR,P2STC,RED | 83-1550-2582 | 1.0 |
| 35 | 00000A769 C | MINCOM | LABEL-IDENTIFICATION,MODULE | 83-3550-1621 | 1.0 |
| 36 | 6050-AC | G.C. ELECT | NUT-HEX,PLAIN,3/8-32 X .563 WD | 83-9262-0073 | 1.0 |
| 37 | RA853 | THOMS & BETS | TERM-LUG, INSUL,R TG,.26WD | 83-9630-0203 | 1.0 |
| 38 | 091-0024-000 | VIKING | INSERT-POLARIZING,CONN,.300 LG | 83-1610-0760 | 12.0 |
| 39 | MS35206-216 | MIL STD | SCREW-MACH,PAN HD,4-40 X 7/16 | 83-9260-4516 | 32.0 |
| 40 | MS35206-227 | MIL STD | SCREW-MACH,PAN HD,6-32 X 5/16 | 83-9260-4530 | 8.0 |
| 41 | YEC 120 | BURNDY | FERRULE-RF CABLE GND,.300 OD | 83-9690-0240 | 16.0 |
| 42 | | NATIONAL | WIRE,PVC,SHIELDED 24GA 2COND | 83-7910-0511 | AR |
| 43 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 44 | TFT-200/22 | ALPHA WIRE | TUBING-TEFLON,#22,.027 ID,NAT | 83-7910-0388 | AR |
| 45 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |
| 46 | 1418 | BIRNBACK | WIRE-BUS BAR, 18 GA, .040 OD | 83-7910-0560 | AR |
| 47 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0052 | AR |
| 48 | | NATL WIRE | WIRE-TYPE B,22GA WHT NYLON JKT | 83-7910-0043 | AR |
| 49 | | NATL WIRE | WIRE-TYPE B,22GA BLK NYLON JKT | 83-7910-0045 | AR |
| 50 | | NATL WIRE | WIRE-TYPE B,22 GA ORNG NYL JKT | 83-7910-0250 | AR |
| 51 | | | WIRE-TYPE B,22 GA ORN NYLN JKT | 83-7910-0303 | AR |
| 52 | | NATL WIRE | WIRE-TYPE B,22GA ORN/BLK NYLN | 83-7910-0297 | AR |
| 53 | | NATL WIRE | WIRE-TYPE B,22GA RED NYLON JKT | 83-7910-0249 | AR |
| 54 | | | WIRE-TYPE B,22 GA RED NYLN JKT | 83-7910-0264 | AR |
| 55 | | SURPRENANT | WIRE-PVC TYPE B, 22 GA,RED-BLK | 83-7910-0066 | AR |
| 56 | | NATL WIRE | WIRE-PVC,TYPE B, 22GA YELLOW | 83-7910-0040 | AR |
| 57 | | | WIRE-TYPE B,22 GA YELLOW NYLN | 83-7910-0259 | AR |
| 58 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,YEL-BLK | 83-7910-0067 | AR |
| 59 | | NATL WIRE | WIRE-TYPE B,22GA,BRN NYLN JKT | 83-7910-0251 | AR |
| 60 | | | WIRE-TYPE B,22GA BRN NYLN JKT | 83-7910-0301 | AR |
| 61 | | NATL WIRE | WIRE-PVC,B NYLON,22GA,BRN-BLK | 83-7910-0300 | AR |
| 62 | | NATL WIRE | WIRE-TYPE B,22GA BLU NYLON JKT | 83-7910-0044 | AR |

P A R T S  L I S T    PL 23059A210-2    REV D

TITLE HSG-SIG ELECT,REPRO ONLY,8 TRK    CATALOG NO. 83-5920-1261

- - - - - - - - - - - - - - - - - M A T E R I A L  R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 63 | | | WIRE-TYPE B,22 GA BLU NYLN JKT | 83-7910-0288 | AR |
| 64 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,BLU-BLK | 83-7910-0070 | AR |
| 65 | | NATL WIRE | WIRE-PVC, TYPE B, 22GA GRAY | 83-7910-0042 | AR |
| 66 | | | WIRE TYPE B,22 GA GRAY NYLN | 83-7910-0261 | AR |
| 67 | | NATL WIRE | WIRE-TYPE B,22GA GRY/BLK NYLN | 83-7910-0298 | AR |
| 68 | | NATL WIRE | WIRE-TYPE B,22GA,GRN NYLN JKT | 83-7910-0248 | AR |
| 69 | | NATL WIRE | WIRE-PVC TYPE B, 22 GA,GRN-WHT | 83-7910-0260 | AR |
| 70 | | SURPRENANT | WIRE-PVC,B NYLON,22GA,GRN-BLK | 83-7910-0069 | AR |
| 71 | | NATL WIRE | WIRE-TYPE B,22GA VIO NYLON JKT | 83-7910-0041 | AR |
| 72 | | | WIRE-TYPE B,22 GA,VIOLET-WHITE | 83-7910-0068 | AR |
| 73 | | NATL WIRE | WIRE-TYPE B,22GA PR/BLK NYLN | 83-7910-0299 | AR |

PARTS LIST PL 23059A330 REV B

TITLE P.C. BD ASSY-FILM SYNC,RECORD CATALOG NO. 83-4930-1711

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C9 | TSD3-15-226 | COMP INC | CAP-FXD,TA, 22UF 15V 20% | 83-1510-6257 | 1.0 |
| C13 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 1.0 |
| C14 | TSD5-20-476 | COMP INC | CAP-FXD,TA, 47UF 20V 20% | 83-1510-6199 | 1.0 |
| C18 | WMF1S47 | CORNL-DUBLR | CAP-FXD,PLSTC,.047UF 100V 10% | 83-1510-4481 | 1.0 |
| C19 | 4610 | ARCO | CAP-VAR,MICA,190-900 PF | 83-1510-6252 | 1.0 |
| L2 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 1.0 |
| Q4 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 1.0 |
| Q5 | 2N3405 | G.E. | TSTR-SI,NPN,GEN PUR,50VCE | 83-1530-2232 | 1.0 |
| R4,R32 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 2.0 |
| R16 | 0A781-7369 | MINCOM SPEC | RES-FXD,FILM,8.2K OHM,1/2W,2%S | 83-1520-7369 | 1.0 |
| R17 | 0A781-7264 | MINCOM SPEC | RES-FXD,FILM,910 OHM,1/2W,2% S | 83-1520-7264 | 1.0 |
| R19 | 0A781-7359 | MINCOM SPEC | RES-FXD,FILM,1.2K OHM,1/2W,2%S | 83-1520-7359 | 1.0 |
| R20 | 0A781-7342 | MINCOM SPEC | RES-FXD,FILM,82 OHM,1/2W,2% S | 83-1520-7342 | 1.0 |
| R23 | 0A781-7333 | MINCOM SPEC | RES-FXD,FILM,33 OHM,1/2W,2% S | 83-1520-7333 | 1.0 |
| R24 | 0A781-7345 | MINCOM SPEC | RES-FXD,FILM,180 OHM,1/2W,2% S | 83-1520-7345 | 1.0 |
| R25 | 0A781-7379 | MINCOM SPEC | RES-FXD,FILM,47K OHM,1/2W,2% S | 83-1520-7379 | 1.0 |
| R26 | 77PR1K | BECKMAN | RES-VAR,COMP,1K OHM,3/4 W, 10% | 83-1520-1211 | 1.0 |
| R27 | 0A781-7331 | MINCOM SPEC | RES-FXD,FILM,27 OHM,1/2W,2% S | 83-1520-7331 | 1.0 |
| T1 | SSO-7 | U.T.C. | XMFR-TSTR SPLY,INPUT,20K OHM | 83-1540-1199 | 1.0 |
| TP1,TP2 | 3-582118-9 | AMP INC | JACK-TIP,.156 WD X .460 DP | 83-1610-0752 | 2.0 |
| 1 | SSO-CH | U.T.C. | BRACKET-XMFR MTG, U TYPE | 83-1320-1663 | 1.0 |
| 2 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 1.0 |
| 3 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 4 | 23059A016 A | MINCOM | BRACKET-COMPONENT MTG,SIG ELEC | 83-3320-1132 | 1.0 |
| 5 | 00000A734-20 | MINCOM | LABEL-IDENT, P.C. BD, *3S* | 83-3550-1591 | 1.0 |
| 6 | 23059A331 B | MINCOM | P.C.BD-FILM, SYNC, RECORD | 83-3640-1220 | 1.0 |
| 7 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 8 | 1434 | BIRNBACH | WIRE-BUS,22GA ROUND | 83-7910-0105 | AR |
| 9 | MS35206-215 | MIL STD | SCREW-MACH,PAN HD,4-40 X 3/8 | 83-9260-4515 | 1.0 |
| 10 | MS35206-213 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 11 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 3.0 |
| 12 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 3.0 |
| 13 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 3.0 |

P A R T S   L I S T   PL 23059A390   REV B

TITLE P.C. BD ASSY-FILM SYNC,REPRO   CATALOG NO. 83-4930-1712

- - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| C1,C10,C12 | TSD5-35-156 | COMP INC | CAP-FXD, TA, 15UF 35V 20% | 83-1510-6209 | 3.0 |
| C2,C9 | TSD5-20-476 | COMP INC | CAP-FXD,TA, 47UF 20V 20% | 83-1510-6199 | 2.0 |
| C3 | TYPE E3FR | MIDWEC | CAP-FXD, PLS .0068UF 100V 5% | 83-1510-4447 | 1.0 |
| C4 | DM15F271J | ARCO | CAP-FXD,MICA, 270PF 500V 5% | 83-1510-5096 | 1.0 |
| C5 | TSD5-6-227 | COMP INC | CAP-FXD,TA, 220UF 6V 20% | 83-1510-6259 | 1.0 |
| C6 | TSD-1-20-225 | COMP INC | CAP-FXD,TA, 2.2UF 20V 20% | 83-1510-6240 | 1.0 |
| C7 | DM15F501J | ARCO | CAP-FXD,MICA, 500PF 500V 5% | 83-1510-5120 | 1.0 |
| C8 | 112A1B334J | ELECTRO CUBE | CAP-FXD,PAPER, .33UF 100V 5% | 83-1510-4301 | 1.0 |
| C11 | TSD5-20-686 | COMP INC | CAP-FXD,TA, 68UF 20V 20% | 83-1510-6211 | 1.0 |
| C13 | DM19F102J | ARCO | CAP-FXD,MICA, 1000PF 500V 5% | 83-1510-5041 | 1.0 |
| C14 | E3XFR | MIDWEC | CAP-FXD,PLSTC, .068UF 100 V 5% | 83-1510-4454 | 1.0 |
| C15 | E3XF | MIDWEC | CAP-FXD,PLSTC,.22 UF 100V 5% | 83-1510-4436 | 1.0 |
| CR1,CR2 | 1N270 | HUGHES | DIODE-GE,GEN PUR,100PIV, 60 MA | 83-1530-0263 | 2.0 |
| K1 | 201-3 | ELECTROL | RELAY-SPST, 2K OHM 24 V DC | 83-1550-3621 | 1.0 |
| L1 | 70F333AI | J.W. MILLER | CHOKE-RF,3.3 MH 5 % | 83-1540-0410 | 1.0 |
| Q1,Q2,Q3,Q4,Q5,Q6 | 2N3391A | GENERAL ELEC | TSTR-SI,NPN, PWR, 25 VCB | 83-1530-2230 | 6.0 |
| R1 | LITTLE DEVIL | OHMITE | RES-FXD,COMP, 1M OHM 1/2W 5% | 83-9520-3220 | 1.0 |
| R2 | 0A781-7399 | MINCOM SPEC | RES-FXD,FILM,470K OHM,1/2W,2%S | 83-1520-7399 | 1.0 |
| R3,R7 | 0A781-7148 | MINCOM SPEC | RES-FXD,FILM,10K OHM,1/2W,2% S | 83-1520-7148 | 2.0 |
| R4 | 0A781-7350 | MINCOM SPEC | RES-FXD,FILM,330 OHM,1/2W,2% S | 83-1520-7350 | 1.0 |
| R5,R10,R23 | 0A781-7388 | MINCOM SPEC | RES-FXD,FILM,120K OHM,1/2W,2%S | 83-1520-7388 | 3.0 |
| R6,R12,R17 | 0A781-7175 | MINCOM SPEC | RES-FXD,FILM,1K OHM,1/2W,2% S | 83-1520-7175 | 3.0 |
| R8 | 3068P-1-203 | BOURNS | RES-VAR,COMP, 20K OHM .2W 20% | 83-1520-1166 | 1.0 |
| R9 | 0A781-7217 | MINCOM SPEC | RES-FXD,FILM,680 OHM,1/2W,2% S | 83-1520-7218 | 1.0 |
| R11 | 0A781-7383 | MINCOM SPEC | RES-FXD,FILM,68K OHM,1/2W,2% S | 83-1520-7383 | 1.0 |
| R13 | 0A781-7348 | MINCOM SPEC | RES-FXD,FILM,270 OHM,1/2W,2% S | 83-1520-7348 | 1.0 |
| R14 | 0A781-7357 | MINCOM SPEC | RES-FXD,FILM,750 OHM,1/2W,2% S | 83-1520-7357 | 1.0 |
| R15,R21 | 0A781-7373 | MINCOM SPEC | RES-FXD,FILM,27K OHM,1/2W,2% S | 83-1520-7373 | 2.0 |
| R16 | 0A781-7221 | MINCOM SPEC | RES-FXD,FILM,100 OHM,1/2W,2% S | 83-1520-7221 | 1.0 |
| R18 | 0A781-7358 | MINCOM SPEC | RES-FXD,FILM,820 OHM,1/2W,2% S | 83-1520-7358 | 1.0 |
| R19 | 0A781-7367 | MINCOM SPEC | RES-FXD,FILM,6.8K OHM,1/2W,2%S | 83-1520-7367 | 1.0 |
| R20 | 3067P-1-502 | BOURNS | RES-VAR, WW, 5K OHM 1/2W 10% | 83-1520-1319 | 1.0 |
| R22 | 0A781-7360 | MINCOM SPEC | RES-FXD,FILM,2.2K OHM,1/2W,2%S | 83-1520-7360 | 1.0 |
| T1 | SSO-11 | U.T.C. | XMFR-TSTR SPLY,OUTPUT,500 OHM | 83-1540-1200 | 1.0 |
| 1 | 23059A391 B | MINCOM | P.C.BD-FILM SYNC, REPRODUCE | 83-3640-1174 | 1.0 |
| 2 | SSO-CH | U.T.C. | BRACKET-XMFR MTG, U TYPE | 83-1320-1663 | 1.0 |

P A R T S   L I S T    PL 23059A390    REV B

TITLE P.C. BD ASSY-FILM SYNC,REPRO    CATALOG NO. 83-4930-1712

- - - - - - - - - - - - - - - - M A T E R I A L   R E Q U I R E M E N T S - - - - - - - - - - - - - - - -

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 3 | MS35206-213 | MIL STD | SCREW-MACH,PAN HD,4-40 X 1/4 | 83-9260-4513 | 2.0 |
| 4 | | | WASHER-FLAT,GENERAL PURPOSE #4 | 83-9261-4002 | 2.0 |
| 5 | MS35338-40 | MIL STD | WASHER-LOCK,SPLIT,HELICAL,#4 | 83-9261-4303 | 2.0 |
| 6 | | | NUT-HEX,SM PATT,4-40 X .188 WD | 83-9260-2201 | 2.0 |
| 7 | 00000A667 B | MINCOM | HANDLE-EJECTOR,P.C. BD,1.50 LG | 83-3270-0371 | 1.0 |
| 8 | 79-022-094-0250 | ESNA | PIN-SPRING, .094 DIA X .250 LG | 83-7280-0270 | 1.0 |
| 9 | 00000A734-21 | MINCOM | LABEL-IDENT, P.C. BD, *9S* | 83-3550-1592 | 1.0 |
| 10 | 7717-2 | THERMALLOY | PAD-TSTR, INLINE, 3 LEADS | 83-9690-0191 | 6.0 |

PARTS LIST    PL 23059A920    REV B

TITLE KIT-P.C.BD,NAB TO DYNATRACK    CATALOG NO. 83-5990-0425

------------------ MATERIAL REQUIREMENTS ------------------

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|
| 1 | 23059A080 | MINCOM | P.C. BD ASSY-CONVERSN,NAB REP | 83-4930-1122 | 1.0 |
| 2 | 23059A130 E | MINCOM | P.C. BD ASSY-DYNATRACK,RECORD | 83-4930-1006 | 1.0 |
| 3 | 23059A140 C | MINCOM | P.C.BD ASSY-DYNATRACK,REPRO | 83-4930-1964 | 1.0 |

P A R T S   L I S T          PL 23059A950          REV B

TITLE KIT-FILM SYNC, SIG ELEC          CATALOG NO. 83-5990-0541

------------------ M A T E R I A L   R E Q U I R E M E N T S ------------------

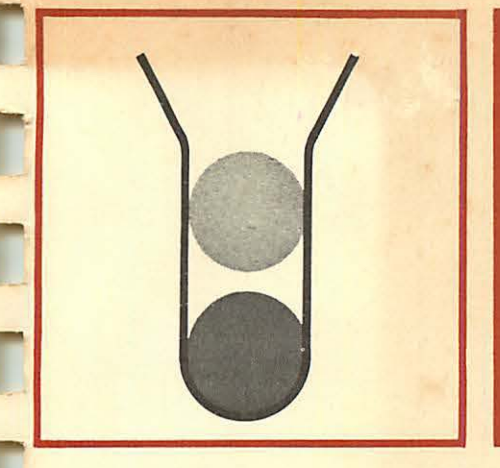
| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | D E S C R I P T I O N | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23059A310 | D | MINCOM | HOUSING ASSY-AUDIO & FILM SYNC | 83-5920-1320 | 1.0 |
| 2 | 23000A310 | A | MINCOM | CABLE ASSY-HEAD, FILM SYNC | 83-4570-0465 | 1.0 |
| 3 | 23028A350 | A | MINCOM | CABLE ASSY-PWR, FILM SYNC | 83-4570-0466 | 1.0 |
| 4 | 23059A020 | F | MINCOM | P.C. BD ASSY-BIAS,ERASE | 83-4930-1121 | 1.0 |
| 5 | 23059A030 | D | MINCOM | P.C.BD ASSY-NAB ERASE COUPLER | 83-4930-1117 | 1.0 |
| 6 | 23059A330 | B | MINCOM | P.C. BD ASSY-FILM SYNC,RECORD | 83-4930-1711 | 1.0 |
| 7 | 23059B040 | F | MINCOM | P.C. BD ASSY-RECORD,NAB | 83-4930-1214 | 1.0 |
| 8 | 23059A050 | B | MINCOM | PWR SUP ASSY-SIG ELECT,W/METER | 83-5920-0822 | 1.0 |
| 9 | 23059A060 | G | MINCOM | P.C. BD ASSY-LNE AMP,SIG ELECT | 83-4930-1091 | 1.0 |
| 10 | 23059A170 | B | MINCOM | P.C.BD ASSY-PREAMP,NAB,REPRO | 83-4930-1940 | 1.0 |
| 11 | 23059A390 | B | MINCOM | P.C. BD ASSY-FILM SYNC,REPRO | 83-4930-1712 | 1.0 |
| 12 | 1-480276-0 | | AMP INC | SHELL-CONN,RECT, .665 WD X.850 | 83-1610-0929 | 1.0 |
| 13 | 60511-4-LP | | AMP INC | CONTACT-ELEC,PIN, .084 DIA | 83-1610-0925 | 9.0 |
| 14 | 1-480304-0 | | AMP INC | SHELL-CONN,RECT, 3 POSITION | 83-1610-1137 | 1.0 |
| 15 | 60510-4 | | AMP INC | CONTACT-ELEC,SOC,18-22GA SIZE | 83-1610-0927 | 3.0 |
| 16 | 201359-3 | | AMP INC | SHELL-CONN,RECT,26 POSITIONS | 83-1610-0674 | 1.0 |
| 17 | 42980-1-LP | 4 | AMP INC | PIN-CONTACT,COMM,20-24 GA WIRE | 83-1610-0688 | 15.0 |
| 18 | 201923-1 | | AMP INC | CLIP-SPRING TENSION, MALE | 83-1620-0126 | 1.0 |
| 19 | 201229-1 | | AMP INC | CLAMP-ELEC,STRAIN REL,.779 MCE | 83-1650-0244 | 1.0 |
| 20 | 200390-4 | | AMP INC | RECP-GUIDE PIN,CENTER,SERIES M | 83-7270-0302 | 1.0 |
| 21 | 200389-4 | | AMP INC | PIN-GUIDE,CENTER,AMP SERIES M | 83-7280-0196 | 1.0 |
| 22 | 1-480305-0 | | AMP INC | SHELL-CONN,RECT,3 POS | 83-1610-1142 | 1.0 |

PARTS LIST    PL 23059A960-2    REV B

TITLE KIT-NAB REPRO,SIG ELEC, 8 TRK    CATALOG NO. 83-5990-0567

MATERIAL REQUIREMENTS

| REF. DES. OR FIND NO. | DRAWING NUMBER - MFGR PART NO. | | MFGR NAME | DESCRIPTION | PH CATALOG NO. | QTY. |
|---|---|---|---|---|---|---|
| 1 | 23059A210-2 | D | MINCOM | HSG-SIG ELECT,REPRO ONLY,8 TRK | 83-5920-1261 | 1.0 |
| 2 | 23059A060 | G | MINCOM | P.C. BD ASSY-LNE AMP,SIG ELECT | 83-4930-1091 | 8.0 |
| 3 | 23059A170 | B | MINCOM | P.C.BD ASSY-PREAMP,NAB,REPRO | 83-4930-1940 | 8.0 |
| 4 | BX28N2.5-2 | | ACDC ELECTS | POWER SUPPLY-28VOLTS 2.5 AMPS | 83-1930-1672 | 1.0 |
| 5 | 23000A030-2 | | MINCOM | CABLE ASSY-HD,REPRODUCE,8 TRK | 83-4570-0390 | 1.0 |
| 6 | 23028A250 | A | MINCOM | CABLE ASSY-POWER,REPRODUCER | 83-4570-0420 | 1.0 |



*"... three generations ahead of its time"*

# 3M BRAND PROFESSIONAL TAPE RECORDER

The 3M Brand Professional Tape Recorder you now own is the finest quality recording instrument available. It has been engineered to the world's most exacting standards for performance and reliability.
Your 3M Brand Professional Tape Recorder was tested at our factory, by electronic measuring equipment, prior to shipment. It met or surpassed every current specification. Therefore, it should operate with maximum performance and without trouble. If difficulties are encountered, however, the following warranty will be of value to you.

## WARRANTY

The 3M Company warrants to the original purchaser that the 3M Professional Tape Recorder, or its "Dynatrack", or its electronic NAB system, or its "Isoloop" tape transport, or its magnetic heads* (if any of these components are purchased separately) is/are free of defects of material and/or workmanship for a period of *one year from date of delivery to the original purchaser.*
3M Company agrees to either replace or repair defective parts subject to the following provisions:

*This warranty shall not constitute any guarantee as to the duration of the life expectancy of magnetic heads, since that is affected by many variables depending upon use, speed, tape, and other factors.

## CONDITIONS OF PARTS WARRANTY

The obligation of 3M under this warranty is limited to remedying any such defect by repairing or replacing defective parts. For the first ninety (90) days after delivery to the original purchaser, defects in materials and workmanship covered by this warranty will be remedied at no cost for labor or material to the original purchaser. During the balance of the first year after delivery to the original purchaser, repairs or replacement of defective parts will be made at no charge for material, but a reasonable charge for labor will be made to the original purchaser.

## CONDITIONS OF WARRANTY

**A.** The attached warranty registration card must be completed and mailed to 3M at the address printed thereon, within ten (10) days from date of delivery of the equipment to original purchaser.

**B.** All defects must be reported within the warranty period to 3M, who will make warranty repairs found to be required either at the place of business of the purchaser or at the 3M factory to which any defective equipment shall be returned, transportation prepaid by the purchaser. Equipment shall not be returned to 3M without 3M's prior instructions to do so.

**C.** Purchaser shall not have used, or allowed to have been used in the equipment, any parts (except accessory items such as transistors, magnetic heads, tape, etc.) not supplied by 3M Company, nor shall this warranty cover damages to the 3M equipment, resulting from the incorporation of other than original systems compatible components or accessories.

**D.** The equipment must not have been altered or modified without the express approval of 3M; nor subjected to misuse, negligence or accident. Serial numbers must not have been altered, defaced or removed.

This warranty is made in lieu of all other warranties, expressed or implied, and 3M's only obligation shall be to repair or replace defective parts as provided in the warranty. 3M shall not otherwise be liable for any injury, loss or damage, direct or consequential, arising out of the use or the inability to use the equipment. Before using, purchaser shall determine the suitability of the equipment for his intended use and assumes all risks and liability whatsoever in connection therewith. The foregoing may not be changed except by an agreement signed by an officer of seller.




3M CENTER · ST. PAUL, MINNESOTA 55101

## 3M BRAND PROFESSIONAL TAPE RECORDER WARRANTY REGISTRATION

Model ______ Serial Number ______ Date ______

I hereby submit for validation this Warranty Registration Certificate for the 3M Brand Professional Tape Recorder identified above. I understand that the One Year Warranty accompanying this Certificate constitutes the sole warranty on this product, and that it is subject to the terms enumerated on said warranty, which I have read and agree to.

Which categories below best describe your recording application(s)?

- ☐ Broadcast
- ☐ Film Producer
- ☐ Duplicator
- ☐ Recording Studio
- ☐ Government
- ☐ Education
- ☐ Medical
- ☐ Industrial
- ☐ Instrumentation
- ☐ Other: ______

Name ______

| CITY | STATE | ZIP |
|---|---|---|

3M COMPANY
Mincom Division
300 S. Lewis Road
Camarillo, California 93010

ATTN: MINCOM WARRANTY VALIDATION

This 3M M23 manual
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to those who have these machines
and want to keep them operational

The 3M M23 was the first 3M iso-loop
tape recorder for professional use

3M M23 machines were around 45 years
old at the time this scan was made

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